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Germany's Raw Materials and Trade Drive

MUCH has been said and written recently of Germany's increased wealth through her territorial gains in Czechoslovakia, and of her trade drive in South-East Europe. Ominous pictures have been painted of the waging of systematic and unrelentless economic warfare. In any attempt to weigh up the facts of the situation in so far as they may affect the trade in this country, it is clear from the outset that Germany's new acquisitions of industrial plants, especially chemical, and of sources of raw materials are substantial. Most important of the chemical plants now in Germany's possession is the Aussig Verein, the leading chemical combine of central Europe, which is said to have been responsible last year for about three-quarters of Czechoslovakia's total production of chemicals. The Aussig Verein through three large plants covers a wide field of chemical production with its output of alkalies, acids, dyestuffs, solvents and fertilisers. It controls, or has interests in, the Oderburg Chemical Co., the leading Czchoslovakian pharmaceutical manufacturers, and the large synthetic ammonia plant at Mährisch-Ostrau, among other chemical concerns. More significant still, the Aussig Verein is closely associated with many Yugoslavian, Rumanian, Polish and Hungarian chemical companies as, for instance, the Zorka heavy chemical works in Yugoslavia. Germany will also gain the bulk of Czecloslovakia's textile, glass and porcelain industries. But it is reported that many of the works in these industries are in a poor state as compared with the chemical plants which are in first-class operating condition.

As regards the natural raw materials of the territory ceded to Germany, the most important is probably the extensive lignite deposits in the Brüx-Dux region. These have an annual output estimated at 14 million tons of lignite. Although this loss will be serious to Czechoslovakia, the gain to Germany will not be so great in proportion, as she already has a very large lignite production herself. But this is by far the most valuable mineral which Germany acquires. There are, of course, other mineral deposits of varying importance, an area of radium-bearing pitch blende being of special value, but there are no supplies of many ores, notably iron and copper, in which Germany is deficient.

It is a natural question to ask whether it is the object of Germany's trade drive in South-East Europe to make good her deficiencies in minerals and other essential raw materials, and if so, to what extent these deficiencies will be met if the proposed commercial agreements with Hungary, Rumania, Yugoslavia, Greece and Turkey negotiated by the German Minister of Economics are brought to a successful conclusion. At present Germany is dependent upon imports for supplies sufficient to her needs of iron, copper, aluminium, tin, zinc and other metals, oil, cotton, wool and rubber, in addition to foodstuffs. Of course, synthetic production of oil and rubber have displaced a certain proportion of imports, but complete self-sufficiency as regards these materials is still a very long way off. Rumania can supply all the mineral oil required, Hungary, Greece and Yugoslavia have sufficient bauxite and the last two countries sufficient chrome ore. Only small quanties of copper and zinc could be furnished by Yugoslavia and Turkey. In the net result Germany would still have to import from countries, other than the South-East European, iron ore, vegetable oils, cotton, rubber and several metals, especially tin and nickel.

There can, therefore, be little real foundation, in fact, for the anxiety that Germany is creating a trade *bloc* in Europe, neither is it likely that Germany's new possessions will have a serious effect on our trade, since the industries in the ceded area were mainly exporting in character. In the case of the chemical industry, it is reported that about half of Czechoslovakia's imports of chemicals last year were from Germany, and that they were about ten times the value of her chemical exports to Germany. As Mr. Chamberlain observed in the House last week, if by means of commercial agreements between Germany and the South-East European countries, the economic position of these countries is improved, then other traders, such as ourselves, would get their share in the increased wealth. While there is no possibility of Germany establishing a trade monopoly in these countries it must be admitted that her economic outlook, as evidenced by the autarchic campaigns of the last few years, is biased in this direction. In any event it is not a position to be met with complacent inactivity, every available means of utilising the greatly superior economic resources of this country and of the Empire to their fullest extent should be closely examined.

> *Synthetic substances are coming to hand which deal radically with the causes of disease, and do not merely modify or moderate the resulting symptoms. This is a change which seems to me certain to continue and to become rapid.*
>
> *—Sir Henry Dale.*

Notes and Comments

Molecular Distillation

ON page 371 are published short extracts from a series of papers presented at a joint meeting of the Chemical Engineering Group and London Section of the S.C.I. on Monday. These extracts can only give an impression of the contents of the papers which were masterly accounts of recent work on molecular distillation. This type of distillation process appeared to result from a successful combination of abstruse physics, the molecular characteristics of organic chemicals, and specialised chemical engineering. The papers considered the whole subject in logical sequence from the theory underlying molecular distillation, the characteristics of the process, the design of the equipment, to the application on the industrial scale. The short space of two hours available for the presentation of four lengthy papers and for discussion was all too short, but such time as there was left for discussion produced a lively debate. The most controversial topics raised were the circumstances under which the definition of the mean free path of a molecule was invalid and the pressure conditions at different points in a vessel connected to a vacuum pump. It was a delight and an education to listen to the scientific reasoning of the different points of view put forward.

A Travelling Scholarship for Safety Students

RECENT reports of the Chief Inspector of Factories have all commented upon the high proportion of accidents occurring to, or caused by, young workers in industry. Imperial Chemical Industries, Ltd., who have long taken a great practical interest in industrial accident prevention, have made a useful contribution to the reduction of accidents to the young by generously providing a travelling scholarship to the value of £100 to be offered by the National "Safety First" Association. The award will be made to the writer of the best essay of not more than 5,000 words, on "The Prevention of Accidents Among Young People." Entrants must be between the ages of 18 and 25 and must be students at a recognised educational institute or be articled apprentices. The closing date for receipt of entries is March 1, 1939. Entry forms and additional particulars can be obtained from the General Secretary, National "Safety First" Association, 52 Grosvenor Gardens. London, S.W.1.

Value of the Trade Press

A TRIBUTE to the technical Press was paid by Mr. Brendan Bracken, M.P., chairman of the Financial News, Ltd., at the annual meeting of the company held in London last Monday. "If good bootmakers never cease to say that there is nothing like leather, we, as publishers, emulate them by saying that there is nothing like the service those papers offer to all engaged in industry, finance and trade. It is sometimes said by unconsidering persons that practical men gain little from 'technical newspapers edited by theorists.' The best answer to this argument, if it can be called an argument, is that Britain's painfully industrial competitors are admirable supporters of their own technical papers and are also subscribing in greatly increasing numbers to English economic and financial journals." Referring to the trade outlook, Mr. Brendan Bracken said that there were plenty of reasons for optimism. Even the crisis had its uses. If as a result of that recent flurry our complacency had been rudely disturbed, let us regard that development as a gain—no small gain. If energy takes the place hitherto occupied by complacency in our economic life, the future of our export trade will be much brighter. It will benefit us greatly if it induces us to pay more attention to our own vast and untilled territories, and to other markets available to reasonably priced British goods. This is the measure of the opportunities offered us. And let us remind pessimists that a British trade drive will be advantaged by economic, financial, and industrial resources which are the envy of our competitors.

The High Level of Employment Figures

THE Ministry of Labour estimates that the number of insured persons between the ages of 16 and 64 in employment in Great Britain in the middle of October was just under 12,300,000. This is not the total figure of those engaged in gainful employment in this country. It is estimated that at least 3,000,000 persons who are not included in the State system of insurance are working for their daily bread. The total population of Great Britain at the last census was just under 45,000,000. Accordingly one out of every three of the population, from babies in the cradle to the aged whose expectation of life is yearly being lengthened, has at the present time a job of work to do. This is a very remarkable ratio, and there has almost certainly never been a better one in British history. The ratio in the middle of the last century, when families were larger and fewer women were employed, was almost certainly not more than one in five. When the depressed politician points to the figures of unemployment it is pertinent to remind him of the far greater virtue residing in the vast total of the employed.

Volume of Employment a Tribute to the Employer

FACTS such as these should never be forgotten when the professional pessimists bewail the state of trade. A volume of employment probably unequalled in any other country in the world, is more particularly a tribute to the 600,000 employers of labour. Taxed up to the hilt and subject in growing measure to harassing Government restrictions, this great body of employers, most of them in a small way, keep their courage up and do not despair of making two blades of grass grow where one grew before. They are the human competitive agency which is creating jobs, and by their enterprise sustaining the unparalleled burden of national finance in an acutely difficult period. The Government departments can play their part in the solution of national problems, but they would be utterly powerless if the free and independent body of British employers were to lose their grip and decline their responsibility to their fellows.

Amendment to Law of Trade Marks and Descriptions

THE Merchandise Marks Act, 1887, laid down that it was an offence to apply a false description or mark to any goods. The interpretation of the word "apply" was held to mean the affixing of the description to the goods themselves or to the covering of the goods. The 1891 Act went a little further by declaring that as regards imported goods, the Customs entry should be regarded as a trade description applied to the goods. The Patents, etc. (International Conventions) Act, 1938, recently passed, now makes it clear, however, that in addition to the provision applying in relation to the actual goods, it will be an offence if a false trade description or trade mark appears in any sign, advertisement, or commercial communication.

Softeners in Rubber Compounding

By
T. L. GARNER, M.Sc., F.I.R.I.

RAW rubber is of little value for most purposes until it has been suitably compounded and vulcanised in its final elastic state, and before this stage is reached there are mixing, processing and moulding operations to be carried out. These vary considerably with the product, but in all cases suitable softening agents to enable the material to process easily are added to the mix. Without their aid, processing would in some cases be impossible, and in all cases accuracy of gauge would be considerably impaired. The breakdown of raw rubber and the incorporation of compounding ingredients may be rendered much easier by the use of suitable softeners, but the type used may require careful choice because of other important considerations. Thus, to help building up an article in an unvulcanised state, a type giving some tackiness to the mix may be desirable; certainly in such a case a greasy type of softener which exudes to the surface will be highly objectionable. Again, excessive use of softeners is never wise because of possible effect on the processing qualities, particularly in extruding, and on the finished product itself.

Softeners in Relation to Fillers

Only rarely is a compounded rubber used which has the minimum of ingredients required to effect vulcanisation. Generally, a mix is compounded with a view to giving the best possible service under particular conditions; alternatively, fillers may be used to reduce the cost of the product. In either case, softening agents will be required to assist in dispersing the compounding ingredients, the amount required varying considerably with the type of material required to be worked into the rubber. Thus, with fillers of relatively coarse particle size, such as whiting, barytes, and other ground materials, dispersion in moderate percentages is easy with little added softener. On the other hand, carbon black, magnesia, and other materials of fine particle size are much more difficult to disperse. Particle shape as well as particle size also affects the ease of dispersion of a compounding ingredient. In the case of many fine particle ingredients the individual particles have considerable affinity for one another, and tend to aggregate rather than to disperse uniformly throughout a rubber mix, as is desirable for maximum value to be obtained from their use. Certain types of softeners, particularly those of a fatty acid nature, are much more efficient than others in dispersing satisfactorily a material such as carbon black.

There are also purposes which softeners serve other than those of assisting processing and dispersing compounding ingredients. Some in fact materially assist good ageing in the rubber compound, others having the reverse effect; some softeners are essential to activate certain organic accelerators of the mercaptobenzthiazole type. The softening agents considered here may be either emollients only, or they may have one or more additional functions in the rubber mix, but such materials as mineral rubber, which are principally used to cheapen rubber mixes, are not dealt with.

The Principal Uses of Softeners

The principal uses of softeners may be summarised as follows:—

(1) To provide the mixed unvulcanised rubber in a suitable plastic state to ensure that it will process satisfactorily during manufacture.

(2) To ensure adequate dispersion of the powder ingredients by assisting the wetting of the latter by the rubber.

(3) To improve the ageing properties.

(4) To activate organic accelerators.

It was suggested by Burbridge a number of years ago that softeners could best be considered in two principal classes: (a) The true softeners, or those which in some way dissolve or enter into the rubber nucleus; (b) the pseudo-softeners, or dispersers, which merely form mechanical mixtures and lubricate the rubber.

Typical examples of the former are pine tars and bitumens, and of the latter, paraffin wax and vaseline.

The Fatty Acid Family

By far the most important class of softener in general use to-day is that containing the fatty acids and their salts. The development of this type arose with the extended use of stearic acid some years ago and this was undoubtedly largely assisted by the necessity for using some form of fatty acid, or fatty acid salt, in conjunction with mercaptobenzthiazole accelerator which was also attracting universal attention at the same time. Other fatty acids, in particular oleic and palmitic, had been used before stearic, but these rapidly became of negligible importance when stearic acid entered the field. The reasons for this decrease in popularity are rather obscure, particularly in the light of more recent developments. As is well known, oleic and stearic acids are obtained by the saponification of animal fats, oleic acid being separated from the higher melting point stearic by suitable pressing operations. For a number of years the demand was for a high grade stearic acid with the bulk of the oleic removed, requiring two or three pressing operations, but from this stage opinion has changed considerably until now very low melting point mixed acids are generally preferred, with a corresponding reduction in price.

The use of cheap wild rubbers years ago resulted in some demand for fatty acid as a stabiliser of the rate of vulcanisation (by supplying the deficiency in fatty acid required for activation), but there is very little of such rubber used to-day, and there is no special demand for this purpose. With accelerators such as mercaptobenzthiazole, it is essential to add fatty acids or their salts for activation, and this has undoubtedly of itself accounted for a large part of the consumption of this type of softener, since this accelerator and one or two similar ones are extremely popular. Although activating certain accelerators in this manner, softeners such as stearic acid actually retard the rate of vulcanisation slightly in a pure mix, but in the presence of zinc oxide they accelerate the chemical vulcanisation. Actually with accelerators of the type mentioned, the rate of vulcanisation is accelerated as judged on physical tests and slightly retarded on chemical tests.

Dispersing Properties of Fatty Acids and their Salts

As dispersing agents, stearic acid and other fatty acids are especially valuable, particularly for such materials as carbon black. Their value is attributed to the fact that the carboxyl group of the polar fatty acid molecule attaches itself to the surface of the filler particles, while the hydrocarbon chain dissolves in the rubber hydrocarbon. In this manner each molecule of rubber filler is oriented. All finely divided powders are assisted into rubber by such softeners, and in tyre tread mixes which contain large amounts of carbon black and rely on its thorough dispersion for their abrasion resistance, the function is of primary importance.

While stearic acid has been of greatest importance in this class of softener, there has of recent years been a tendency to use fatty acid salts such as zinc laurate, in increasing quantities. The value of such a material is that it is considered to have still better dispersing properties, and is free from objectional bloom which can take place in unvulcanised stocks when fatty acid is present in large amounts.

The pine tar oil type of true softener softens rubber stock more than any other. A range of gravities is available, but in

all cases the colour limits the application to those rubbers which are not brightly coloured; otherwise such softeners are extremely efficient and widely used. While they retard vulcanisation slightly, and have a small detrimental effect on the mechanical properties of the vulcanisate, they increase the reinforcing effect of carbon blacks in mixings, and give a lower permanent set than stearic acid. As regards ageing properties, the pine tar oils are among the best softeners. The water content should not exceed a figure of 2 per cent. if freedom from porosity is to be ensured with all types of mixes, but any excess moisture should normally be removed in milling operations. The actual gravity of these tack-producing softeners varies considerably in different specifications, but it should be controlled within .005.

Other Oils

All types of oils are emollients for rubber and both animal and vegetable oils are used. Vaseline and mineral oils are pseudo-softeners and are efficient in large quantities, although the latter do not impart good ageing properties. Rosin oil is used to a limited extent. The wool grease extracted from the fleece of sheep, known as degras, has also been used to some extent. Unlike other animal fats, it is not composed of the glycerides of fatty acids, but consists of the higher solid alcohols, cholesterin, and isocholesterin, free, and also as the esters of fatty acids. In particular, this softener is considered to be valuable as a disperser for carbon black, but in using it in this way, it must be noted that it is still necessary to use a proportion of fatty acid to compensate for its lack of free acid.

Waxes

Generally, waxes do not give good ageing properties to rubber, but they have an advantage in that they bloom to the surface of vulcanised rubber and form a protective layer of wax over it. As a result, they are valuable ingredients in mixings which must withstand the action of light, but the effect is purely mechanical and only protects the product in the absence of any wear on the surface. Paraffin wax melting at about 50° C., is usually employed for this purpose, but should not be used in too large amounts since greasy softeners of this type also tend to exude to the surface of unvulcanised stocks, and may render subsequent processing, for example plying-up operations, difficult.

General

Asphaltic fluxes are efficient softeners, especially where rubber is required with tacky surfaces in the unvulcanised state (for plying-up operations, etc.). The so-called liquid rubber, a viscous, tacky mass of gravity about 1.08 has been used extensively in past years and is particularly applicable to frictions for tape, and for rubbers containing large amounts of compounds, because of its binding properties. Other special softeners still employed include such materials as Burgundy pitch, rosin and similar products.

In concluding this description of various softeners used in the rubber industry some reference must be made to the softening effects of ordinary ingredients used primarily in the mix for some other purpose. Thus, some pigments, such as zinc oxide, soften rubber appreciably, the action of such materials being explained by the "wetting" theory, those pigments softening rubber which are readily wetted by it. Other materials seem to behave more like oil on water when added to rubber, and are quite difficult to incorporate. Lime is an example of the latter, and this was in fact used formerly to remove tackiness from rubber—often soft, tacky, wild varieties.

Certain organic accelerators also affect the plasticity of uncured rubber, such as diphenylguanidine, and it is obvious, therefore, that when designing a mix, the softener content must be considered in relation to the effect of the other ingredients.

Letter to the Editor

Platinum Catalysts for Sulphuric Acid Contact Plants

SIR,—In your issue of October 22 in the course of a description of the new contact plant for the manufacture of sulphuric acid in operation at the works of F. W. Berk and Co., Ltd., there was a reference to platinum catalysts which calls for comment. In effect a modern plant designed to take advantage of the latest advances in chemical engineering with elaborate precautions for the removal of dust and mist from the gases, operating under carefully controlled conditions and using high grade raw material (sulphur) was compared with a war-time plant using unspecified raw material. Is it fair to attribute the good performance of the modern plant to the fact that it uses a vanadium catalyst whereas the war-time plant used a platinum catalyst? A fairer comparison would be between modern plants, where it would be seen that platinum catalysts still possess many advantages such as ability to handle richer gases (10 per cent. SO_2) than vanadium catalysts thereby giving a more compact plant for a given output and lower power consumption.

According to A. M. Fairlie ("Sulphuric Acid Manufacture," American Chemical Soc. Monograph Series 1936) the performance of platinum catalysts has been improved in recent years, for instance, the amount of platinum required in U.S. plants per ton day of 100 per cent. sulphuric acid is from 5.5 to 7 oz. troy for platinised asbestos or platinised magnesium sulphate compared with 13 to 16 oz. during the war, while it is only 1.5 to 2.1 oz. for platinised silica gel. The latter type of catalyst first used on the factory scale in 1926 has the advantage of being immune to arsenic poisoning.

Consequently it will not surprise your readers to learn that modern plants using platinum catalysts continue to be installed. Furthermore, platinum catalysts at the end of a useful and lengthy life command a high scrap value.—Yours faithfully,

R. H. ATKINSON.

64 Twyford Avenue, Acton, W.3.
November 5.

RECENT PROGRESS IN BAKELITE MATERIALS

A SHORT talk by Mr. C. C. Last, of Bakelite, Ltd., prefaced the showing of the company's film "Bakelite—The Material of Infinite Uses" at a recent meeting of the Birmingham and Midland Section of the Institute of the Plastics Industry. Mr. Last confined his remarks to a discussion of recent progress in phenolic materials. He outlined the properties of a new moulding material which had been specially produced to withstand the effects of chemicals and prolonged immersion in water. Successful research on this subject enabled a material to be marketed suitable for the production of moulded water softeners. Another interesting development was the production of a phenolic moulding powder which was completely free from odour.

Materials for rubber printing stereos were now being made from Bakelite material, these offering many advantages over normal types of flong. Dealing with laminated materials, the lecturer described Blisterproof veneers which were resistant to heat, moisture, fruit juices and alcohol. Available in light colours, these veneers suffered no permanent damage when subjected to direct contact with burning cigarettes. The industrial grades of the materials were widely employed for gear wheels, bearings, etc., as well as many electrical applications.

PLANT for the manufacture of cyclohexanol and methyl cyclohexanol has been completed by the Paris firm of Huiles, Goudrons and Dérivés and a plant for extracting heavy oils from coal tar is under construction. A series of new synthetic products is also being developed on the semi-technical scale.

Some Combustion Phenomena of Higher Hydrocarbons

Relation between Ignition Pressures and "Knock" Ratings—Cool Flame Formation

THE classical researches of the late Professor W. A. Bone and his collaborators quite definitely established that the oxidation of a simpler hydrocarbon gives rise to a series of intermediate oxygenated compounds, said Professor D. T. A. Townend, D.Sc., in a paper on "Some Combustion Phenomena of Higher Hydrocarbons," presented at a joint meeting of the Institute of Fuel and the Society of Chemical Industry at Bristol on November 3. According to Professor Bone's view they arose by successive stages of hydroxylation. Almost all the predictable intermediate products or their thermal decomponents could be isolated in quantities varying with mixture composition and environmental conditions, as follows:—

Methane gave: Methyl alcohol, formaldehyde and formic acid.

Ethane gave: Ethyl alcohol, acetaldehyde, acetic acid, methyl alcohol, formaldehyde and formic acid.

Ethylene gave: C_2H_4O-isomers (acetaldehyde and ethylene oxide), acetic acid, formaldehyde and formic acid.

Substances of peroxidic character were also found together with a variety of other products due to secondary reactions. Recent discussion has centred mainly upon the possible kinetic mechanisms which ultimately lead to the formation of these products.

When such a hydrocarbon-oxygen mixture is introduced into an enclosure at a temperature such that reaction will eventually take place, there is an "induction" period during which very little oxygen is consumed. This is followed by a period of relatively rapid reaction during which the greater part of the hydrocarbon or oxygen, whichever is in defect, is used up; and with increase in the experimental pressure or temperature, the reaction accelerates so that under suitable conditions spontaneous ignition may ultimately occur.

Chain Reactions in Simpler Hydrocarbon Combustions

Such combustions are now known to exhibit the characteristics of chain reactions. Thus, the "induction" period is usually regarded as one during which a "surface" reaction is proceeding, which gives rise to an adequate concentration of an intermediate product; once attained, this material is able to initiate chains in the system faster than they can be broken and "reaction" sets in. Moreover, the rate of reaction conforms to no simple order, and while increasing with increase in the absolute hydrocarbon concentration, it is usually uninfluenced by variation in that of the oxygen. Increasing the surface/volume ratio of the reaction vessel also decreases the reaction rate, and, as already mentioned, small concentrations of foreign substances may act either as inhibitors or promoters.

It is of particular importance to note that many of the known intermediate oxidation products when added to the media are found powerfully to promote reaction, and aldehydes as a class have been found to be specially potent in this regard. Bone and Gardner (*Proc. Roy. Soc.*, 1936, A *154*, 297) made a special study of the part played by formaldehyde in the slow combustion of an equimolecular methane-oxygen mixture finding the aldehyde not only powerfully to promote the oxidation generally, but that at the end of the "induction" period an equilibrium proportion of it was present which was independent of the initial reaction temperature. This accorded well with the view of Norrish (*Proc. Roy. Soc.*, 1935, A, *150*, 36) that in the oxidation of methane the primary chain is propagated by oxygen atoms which first arise by a surface oxidation of formaldehyde, thus (1) $HCHO + O_2 \longrightarrow H.COOH + O$ followed by the chain (2) $CH_4 + O = :CH_2 + H_2O$ (3) $:CH_2 + O_2 = H.CHO + O$.

Norrish regarded the formation of methyl alcohol as arising at sufficiently high pressures by the triple collisions $CH_4 + O + X = CH_3OH + X'$, X being a third body (de-energiser) rendering the product stable. Bone and Gardner were of the opinion, however, that methyl alcohol, although a less potent promoter of the reaction than formaldehyde, was the primary product and not formaldehyde. While not dissenting from Norrish's view that both $:CH_2$ radicals and oxygen atoms might be concerned in the initial stage of the methane oxidation, they thought that the reaction might be initiated by the decomposition of meta-stable methyl alcohol.

A less simple chain than that of Norrish has recently been advanced by Lewis and Von Elbe (*J. Am. C.S.*, 1937, *59*, 976) whereby the formaldehyde produced gives rise by a surface reaction to OH radicals which react with the methane in the primary chain.

Higher Hydrocarbons

A much greater degree of complexity, Professor Townend continued, would naturally be expected with higher hydrocarbons due to the number of intermediate compounds involved in their complete oxidation and also to the probability of secondary reactions interfering with the main course of events: the data available for defining accurately these changes have hitherto been very meagre. During the past decade, however, a number of investigations into the combustion of such fuels have been carried out, designed principally to throw light on internal combustion engine problems. These have shown that when more than three carbon atoms are present in the molecule, additional complications arise mainly owing to the incidence of processes which give rise over certain temperature ranges to the phenomena associated with "cool flames."

In 1933, Townend and Mandlekar began a systematic study of the influence of pressure on the spontaneous ignition of the paraffin hydrocarbons generally, and it was then discovered with the higher paraffins that whereas at low pressures ignition did not occur below 500° C., on the attainment of a critical pressure, which varied with the material concerned and with the composition of its mixture with air, it occurred abruptly in a temperature range below about 370° C., which was soon recognised as that in which only cool flames are normally observable.

Professor Townend then described a systematic determination of ignition points over wide pressure ranges carried out by him and his collaborators. This has provided a means which has proved very fruitful in throwing light on the nature of the problem as a whole; it has also been particularly helpful in the elucidation of "knock" in internal combustion engines.

Discussing the relation between ignition pressures and "knock" ratings, Professor Townend said it is now generally recognised that the behaviour of any fuel in an engine is largely influenced by the chemical reactivity of the unburnt medium ahead of the flame, this being controlled by the degree of compression, the working temperature and the speed of running. In such circumstances where the available time interval is short any *appreciable* chemical reaction must be intense and conditions will proximate closely to the ignition point.

When it was discovered with the higher paraffins that (1) the lower ignition region approximated to the usual compression temperatures attained in an engine, (2) ignition occurred in this region with a minimum time-lag on the attainment of a critical pressure, while at higher temperatures the mixtures were non-ignitible; (3) not only did ignition occur

at progressively lower pressures as the series was ascended but the time-lags were also materially reduced, and (4) the presence of an anti-"knock" raised the pressure necessary for ignition, it became clear that it was normally to the pressure requisite for ignition in the lower range that the standard "knock" ratings of fuels were related. This bore out in a remarkable manner the prediction of Prettre that the "cool flame" processes observed at atmospheric pressure were those most likely to be associated with the phenomenon of "knock" in engines.

Ignition Pressures and "Knock" Ratings

The relationship between the pressures requisite for spontaneous ignition in the low temperature range for equivalent mixtures (considered together with the corresponding time-lags) and the "knock" ratings of the paraffins and olefines is clearly brought out in the following table:—

RELATION BETWEEN IGNITION PRESSURES AND KNOCK RATINGS

	A Minimum pressure (atms).	B Time lag (sec.).	C Critical compression ratio.	Ratio A/C.
Paraffins—				
Methane	—	—	non-knocking	—
Ethane	—	—	14.0	—
Propane	6.8	3	12.0	0.57
Butane	3.2	2	6.4	0.50
Pentane	2.2	1.4	3.8	0.57
Hexane	1.9	1	3.3	0.58
Heptane	1.58	0.7	2.8	0.57
Octane	1.3	0.3	<2.8	>0.47
Iso-Butane ..	4.8	3	8.9	0.54
Iso-Octane ..	4.85	1.7	7.6	0.64
Olefines—				
Ethylene ..	—	—	·8.5	—
Propylene ..	5.0	3.0	8.4	0.59
α-Butylene ..	3.35	3.5	—	—
α-Amylene ..	2.4	1.8	5.8	0.42

As an even further test on this relationship recently an examination has been made of the characteristics of spontaneous ignition of some of the newer high-duty fuels, notably iso-octane, to which reference has already been made, di-isopropyl ether and acetone (*J.C.S.*, 1938, *238*). When considering chemically dissimilar fuels, however, an attempt at a more precise method of comparison is necessary, involving in particular (*a*) ignition point curves pertaining to ignition within comparable short time-lags and (*b*) a knowledge of the approximate compression temperatures in the cylinder head. As a result of graphical work undertaken on these lines, Professor Townend said there would now seem little doubt that "knock" is brought about by conditions closely related to those which would induce spontaneous ignition.

In order finally to establish the relationship just described, he continued, it is necessary to study the influence of increased pressure above the minimum ignition pressures in reducing the time-lags still further than has hitherto been practicable, so that by more accurate extrapolation the approximate pressure and temperature conditions for ignition within the very short time-lags available in engine practice might be predicted. Dr. G. P. Kane has made a notable advance by studying the influence of pressure on the time-lags at pressures up to 15 atmospheres with an accuracy of 1/100 sec., and he has shown that with propane and propylene the spontaneous ignition pressures for short time-lags would agree closely with engine conditions at the incidence of "knock."

Ignition Set Up by Cool Flame Formation

Finally, Professor Townend described some observations made during the past two or three years at South Kensington in investigation of the process by which ignition is set up in the temperature range 300° to 400° C. by prior cool-flame formation. He summarised these observations as follows:—

"Cool flames are the outcome of an initial oxidation and attendant decomposition process: the most reactive mixtures occurring with a combustible oxygen-ratio of about 1:1 or 2:1, or with some fuels even higher.

"While in mixtures of ether and air the velocity of the cool flames does not vary within the experimental error with pressure, temperature or mixture composition (Townend and Chamberlain *Proc. Roy. Soc.*, 1936, A., *154*, 95), in ether-oxygen mixtures the cool-flame velocities definitely increase with pressure.

"If the pressure be raised to a critical value a blue flame is formed some distance behind the cool flame in its combustion products. In closed vessels this "blue" flame travels at a velocity much greater than that of the cool flame.

"The events subsequent upon the formation of the "blue" flame depend upon the amount of oxygen remaining in the mixture. With little oxygen, the flames will probably travel independently; with more oxygen the "blue" flame will increase in velocity and travel closely behind the cool flame, causing its velocity to increase. With still further oxygen the "blue" flame becomes a normal flame; and, once initiated, it travels through the cool flame, replaces it and travels on with high velocity. In suitable circumstances, as with certain ether-oxygen mixtures, detonation is set up.

"The investigations so far completed have shown that the cool flame of diethyl ether produces high concentrations of acetaldehyde and peroxidic substances (probably hydroxy-alkylperoxides), the proportionate amount of the latter being apparently independent of pressure. These materials are destroyed in the "blue" flame which also effects the decomposition of much of the excess of combustible. The temperature of the blue flame is much higher than that of the cool flame; none the less, this flame does not appear to be initiated thermally, for it arises in the partially chilled products of the cool flame.

"The cool flame of acetaldehyde which we regard as of great relevance to the combustion of higher hydrocarbons gives rise to products which seem to indicate the main reaction as being an association of one molecule of the aldehyde and one molecule of oxygen which give rise to equal volumes of CO, H_2O and H.CHO, some of the remainder of the aldehyde being decomposed into CO and CH_4.

Presence of Peroxidic Products in Flame Products

"It thus appears that, whatever the mechanism giving rise to cool flames, a certain concentration of peroxidic bodies is always found in the flame products, which agrees with the finding of Newitt and Thornes. With falling temperature behind the cool flame, accumulating peroxidic bodies attain a critical concentration at which they break down explosively (apparently by a chain mechanism) and thus propagate a "blue" flame through the cool flame products. Whether the ensuing flame is mainly such an exothermic decomposition or an oxidation depends on the oxygen concentration; there is also evidence that this decomposition can, under suitable conditions, be so violent as to set up a "shock wave" type of flame propagation which would be akin to "knock" in engines. At high enough pressures, as in Kane's experiments, which correspond with those in an engine, the cool-flame processes appear to have no separate existence, the peroxidic bodies being formed so rapidly as to displace them. There is probably a strong parallel also between the pressure required for the initiation of the "blue" flame and the critical pressure at which peroxides decompose explosively as described by A. C. G. Egerton and E. J. Harris (*Nature*, 1938, *141*, 472) but as far as our present work has allowed of our forming any opinion on the matter, Maccormac and I would dissent from the view that a "cool" flame is itself an exothermic decomposition of peroxides (*cf.* Mondain, Monval and Quanquin. *Compt. Rend.*, 1930, *191*, 299). Perhaps the most satisfactory aspect of the work as a whole is that the spontaneous ignition theory of knock now seems definitely to link up with the views of Egerton and his collaborators on the importance of peroxide formation in the cylinder head.

"The most intriguing problem which yet has to be solved is the kinetic interpretation of cool flames."

Molecular Distillation

The Principles of the Process, Design of Equipment, and Application to the Concentration of Vitamins

A SERIES of four papers on Molecular Distillation were read at a joint meeting of the Chemical Engineering Group and the London Section of the Society of Chemical Industry at Burlington House, W.1, on Monday. These papers were "The Theory and Development of High-Vacuum Distillation," by Drs. C. R. Burch and W. J. D. van Dijck; "The General Technique of Molecular Distillation. Part I. The Characteristics and Scope of the Process, by Mr. E. W. M. Fawcett; Part II. General Design of Molecular Distillation Equipment," by Dr. G. Burrows; and "The Application of Molecular Distillation to the Concentration of Vitamins," by Drs. W. Jewell, T. H. Mead and J. W. Phipps.

Historical Development of Molecular Distillation

In the first paper it was stated that molecular distillation has become of practical interest to chemists during the past nine years. It is characterised by the use of permanent gas pressures so low (10^{-6} atmospheres) as to play no essential part in determining the speed of distillation, or even in determining whether distillation takes place or not. Thus its development could hardly have taken place before the attainment of such pressures had become a technical commonplace rather than a laboratory achievement. This condition was satisfied by the invention of the condensation pump, in 1916, by Langmuir. The first application of molecular distillation was made in 1922, by Brönsted and Hevesy, in separating the isotopes of mercury. The method was not applied to organic chemicals until 1929, when three investigators, working independently, published practically simultaneous accounts of the distillation of various organic substances: petroleum fractions, sundry phthalates, stearates, oleates, citrates, and tricresylphosphate, paraffin wax and cane sugar. Since that time, the method has been used on many other materials, perhaps the most important use being the concentration of vitamin-*A* from fish-liver oils.

It is easy to exhaust a conventional laboratory distilling apparatus to a pressure so low that the residual gas is without appreciable influence on its performance. When this is done, the speed of distillation is determined by the rate at which vapour can flow through the pipe connecting the "boiler" and condenser, under the driving force of its own saturation pressure. So it becomes necessary to use saturation pressures of the order of 1 mm. Hg. in order to obtain a reasonable speed of distillation. If it is wished to make any large reduction in the temperature of distillation—and therefore in the saturation pressure—it accordingly becomes essential to modify the shape of the still, in order to preserve a reasonable rate of distillation. So it is necessary to use an apparatus in which a cooled condensing surface is supported a few cm. above a shallow heated pool of liquid, the whole being enclosed in an evacuable chamber.

Application of the Process to the Technical Scale

When considering the factors that may limit the enlargement of molecular distillation apparatus to the technical scale, it is found that the real limit is determined by the removal of the unavoidable uncondensable gases, which have either remained dissolved in the distilland, even after careful degasing, or are produced by slight decomposition during the distillation. This uncondensable gas is forced by the stream of vapours against the condensing surface, which is thus screened. The invention of a self-pumping still, that is, a still in which the distilling vapours themselves force the uncondensable gases to the place at which the pump can handle them, was of great importance for further technical development.

Originally, this self-pumping effect was obtained by directing the distilling vapours by baffles. In another construction which seemed to offer even better technical possibilities the self-pumping effect is obtained by placing sets of two evaporating surfaces and two condensing surfaces in such a position with respect to one another that the distance which the vapours have to travel before condensing is in one direction always greater than that in the opposite direction.

In such a system the uncondensable gases which escape sideways from the condensing surfaces are swept by the adjacent vapour stream to the next condensing surface and on an average are thus swept a greater distance in the one direction than in the opposite, so that they are finally transported to one end of the system where the pump removes them. The authors described plants built on these two principles of construction.

In the paper describing the characteristics and scope of the molecular distillation process, Mr. E. W. M. Fawcett said, actually two types of high-vacuum evaporative distillation process can be differentiated as follows:—

(1) Direct transfer of molecules from evaporator to condenser with no possibility of return to the evaporator. This may be defined as molecular or ideal distillation and the rate of distillation is identical with the ideal rate of evaporation.

(2) At the other extreme there is, when the distance between the evaporator and condenser is large compared with the mean free path, an ordinary high vacuum evaporation under conditions of equilibrium between vapour and evaporating liquid, and a stationary pressure due to distilling molecules in unco-ordinated motion in the gap. Under these conditions it can be shown that the rate of distillation is of the order of one-half the ideal rate when the evaporating and condensing surfaces have equal areas.

General Characteristics of the Process

The general characteristics of the molecular distillation process make it particularly suitable for the treatment of thermally labile materials, for, in the first place, the distillation is carried out at the lowest possible temperature, and in the second place, owing to the fact that the bulk of the evaporating molecules move direct to the cold condenser and are retained there, the possibility of thermal decomposition of the vapour molecules is reduced to a minimum.

The earliest forms of equipment were batch or discontinuous devices developed by modification of conventional laboratory distillation apparatus. The first continuous stills took the form of a series of horizontal trays as the evaporating surface, the distilland being fed to the uppermost tray and flowing by gravity to each of the series in turn. From this elementary type the so-called "falling-film still" has been developed, and this form has displaced all others to a very great extent.

Since the molecular distillation process is characterised by the absence of a fixed temperature of distillation at a given pressure, it is clear that in a continuous still of the falling-film type the rate of distillation of any component and the degree of separation of the constituents of a mixture obtainable is a function of a number of variables and these variables are inter-dependent. The more important of these variables, namely, the pressure of foreign molecules in the still, the temperature of the distilland, the film thickness of the distilland, and the gap between evaporator and condenser, were discussed in so far as they affect still design and operation.

The paper on the general design of molecular distillation equipment by Dr. G. Burrows described various representative alternative designs of molecular distillation apparatus which are available for use. Descriptions were given of forms of discontinuous and continuous stills; pumps for the production

of high vacua; the fabrication of components of high vacuum distillation plants and details of design such as demountable joints, vacuum valves, and extraction pumps.

The last paper on "The application of molecular distillation to the concentration of vitamins," by Drs. W. Jewell, T. H. Mead, and J. W. Phipps, of The British Drug Houses, Ltd., stated that the liver and visceral oils extracted from fish provide the best industrial sources of vitamin-*A*. As far back as 1924, attempts had been made to concentrate vitamin-*A* by ebullient distillation, *in vacuo*. The results showed that the vitamin is largely destroyed during equilibrant vacuum distillation. In 1932, Heilbron, Heslop, Morton, Webster, Rea and Drummond (*Biochem. J.*, 1932, *26*, 1178) referred to unsuccessful attempts to distil a concentrate from halibut liver oil at pressures stated to be 0.0001 mm., but went on to describe how by helpful collaboration with Carr and Jewell success had been obtained by using a new type of molecular still whereby rapid fractional distillation could be effected at a pressure below 0.0001 mm., under which conditions the vitamin distils without decomposition. This work, carried out in the B.D.H. laboratories, was in fact a continuation of what the authors had been doing for some time. It was their object to see whether practical use might be made of this discovery. By continuing this work, Carr and Jewell (*Nature*, 1933, *131*, 92) prepared the purest vitamin-*A* obtained up till that time.

In America, Hickman (U.S.P. 1,925, 559) was working quite independently on fractionating cod-liver oil by molecular distillation. He showed that by heating a thin film of oil at 100°-200° in a high vacuum, namely, at pressures below 0.01 mm., and condensing the vapour given off at a point between 1 and 0.001 in. from the film, a distillate exceptionally rich in growth-promoting constituents was obtained practically free from fishy taste and odours. In January, 1933, Carr and Jewell applied for a patent (B.P. 415,088) covering the preparation of concentrates from fish liver oil direct, the purification of vitamin-*A* alcohol, and a means whereby the vitamin, instead of being recovered in the distillate, might be concentrated in the residue.

B.D.H. Vitamin Recovery by Molecular Distillation

That molecular distillation offered interesting possibilities for the commercial recovery and concentration of vitamin-*A* was thus recognised by The British Drug Houses in this country and by the Eastman Kodak Co. in America. The first-named company has employed the method for successful production since the year 1932, and the Eastman Kodak Co., after making many valuable advances in the technique, has formed a special company, called Distillation Products, Inc., to take care of its development in the U.S.A.

The authors then described the types of still (small falling-film still, laboratory multi-stage still, technical all-metal still, and cyclic still) which they had applied to vitamin production. They briefly summarised the essential requirements in applying molecular distillation to the recovery of vitamin-*A* as follows:

(1) The oil fed to the still must conform to a predetermined standard of moisture, free fatty acids, and nitrogenous material.

The still must include:

(2) A thoroughly efficient degassing system.

(3) Arrangements for maintaining a constant feed rate; it is necessary to be able to vary this between selected limits.

(4) Means for separately and accurately controlling the temperature of the oil at each stage in the operation.

(5) A preliminary still section in which light fractions may be removed.

(6) Two or more distillation sections for the recovery of fractions rich in vitamin.

(7) A further section for stripping away the last traces of recoverable vitamin.

(8) A system of backing, booster, and diffusion pumps sufficient to ensure the maintenance of a high vacuum at every point in the system.

Catalytic Dehydrogenation of Camphor

Hydrogen as Diluent Maintains Catalyst Efficiency

THE use of hydrogen as a carrier for the catalytic dehydrogenation of camphor to borneol has been found by Christensen, Gilbert, and Bocek to be very efficient. (*J.A.C.S.*, 1938, *60*, 2,331-3). The spongy form of copper obtained by reducing fused cupric oxide with hydrogen at 200° was employed as a catalyst. When borneol vapour was passed over this at 360°, a 96-100 per cent. conversion was obtained initially, but after a few runs the efficiency markedly decreased, and the colour of the copper changed also, due probably to adsorption of decomposition products, or perhaps to superficial oxidation. The original colour could not be restored by reduction with hydrogen.

In order to reduce the concentration of borneol, hydrogen was used as a diluent for the vapour. This had the effect of maintaining the efficiency of the catalyst at a high level for a much longer time. Thus after 10 runs the efficiency was still 96 per cent., and after 13 had only decreased to 86 per cent., at the same space velocity. The mass action effect which hydrogen might be expected to exert in the direction of preventing dehyrogenation appears to be entirely outbalanced by its diluting effect, and also its inhibition of the catalyst oxidation, so that the net effect is highly beneficial.

Carbon dioxide was also investigated as a possible diluent but found not to be in any way so efficient. Other catalysts for the reaction were tried, and cobalt in particular was found to have very desirable characteristics, being possibly even more efficient than copper.

SLAG IN GLASS MAKING

Y. P. Varshney (*Science and Culture*, 1938, *4*(*i*), 45-7) reports results of experments made on the utilisation of slags produced in iron and steel plants as a constituent in glass-making batches. He has shown that glass cheaply made with slag and felspar can be easily used for manufacturing bottles, jars, floor tiles, roof tiles, etc., in various transparent colours as well as in opaque and black varieties. A batch of the following composition and analysis of melt gave a most workable and fluid bubble-free bottle-green glass at a temperature of 1,350° C.

Composition.		*Analysis of Melt.*	
Slag	100 parts	SiO_2	56.42 per cent.
Sand	150 ,,	Al_2O_3	12.42 ,, ,,
Felspar	150 ,,	Fe_2O_3	0.18 ,, ,,
Slaked line	35 ,,	MnO	0.30 ,, ,,
Soda ash	90 ,,	CaO	12.96 ,, ,,
		MgO	1.03 ,, ,,
		Na_2O	11.50 ,, ,,
		K_2O	4.82 ,, ,,

On a semi-commercial scale, the batch became workable after about 16 hours melting in a pot furnace at a temperature of 1,350° C. It was found that in these glasses large percentages of potash give good brilliance, the use of slag reduces the cost by about 50 per cent.

UTILISATION OF TAR FROM NATURAL GASES

THE results of experimental work conducted to find uses for tar that may be formed in the conversion of natural gas to liquid fuel are described in a report (Technical Paper 587) issued by the Bureau of Mines, U.S. Department of the Interior. The process described in the present paper is designed to increase the total yield of liquid products from the pyrolysis of natural gas by approximately 25 per cent. The immediate object of the work was to convert the naphthalene fraction of the tar, formed by pyrolysis of natural gas, into liquid products by hydrogenation, using the hydrogen formed in the cracking reactions to carry out the conversion in a continuous process where hydrogenation follows directly after pyrolysis.

Research on Refractory Materials

The Action of Alkalies, Hydrocarbon Gases, and Slag on the Products

THE 29th report of the Refractory Materials Joint Committee presented at the 10th Autumn Research Meeting of the Institution of Gas Engineers is summarised below.

Since investigations on this subject were commenced in 1933, the study of the interaction with refractory materials of alkali chloride vapours in particular has claimed considerable attention. Two further papers in the present report are devoted to a further consideration of certain aspects of alkali chloride action. The first is concerned more especially with the mechanism by which small amounts of various constituent oxides of the refractory may be caused to migrate to the surface or be entirely volatilised. It is shown that complete volatilisation is favoured by reaction of the clay or silica refractory with sodium chloride under dry conditions in an inert atmosphere, whereby some conversion of the brick constituents to volatile chlorides takes place. Migration of oxides to the surface of the refractory is found to be favoured by reaction with sodium chloride in the presence of dry air or oxygen. It is concluded that conversion to chlorides takes place within the refractory and re-conversion to oxides at the surface. In some instances the iron oxide so concentrated at the surface has been found to promote the decomposition of carbon monoxide and the growth of carbon aggregates under suitable conditions of temperature. Migration or volatilisation of oxides present in the refractory is considerably reduced when reaction with sodium chloride occurs in the presence of steam.

In a second paper the alteration in transverse strength on exposing various refractory materials to the action of potassium chloride vapour at 1,000° C. is considered. Appreciable changes in the modulus of rupture are reported, but these are not found to be related to the changes in dimensions of the specimens. Other factors intervene, such as the development of glassy material and the effect of heat treatment in itself.

The effects of methane and of town gas in causing the disruption of certain types of firebrick at about 800° C. have been described in the 26th, 27th and 28th reports. A further investigation of the action of methane has now been made with particular reference to the mechanism of the disintegration. The evidence indicates that after a somewhat variable period of induction in which the iron spots are brought to a reactive condition methane decomposes directly into carbon and hydrogen. The growth of the carbon depositions around the iron spots brings about the disruption of the firebrick. In some cases the iron spots are not activated and such firebricks resist disintegration.

The commencement of a fresh investigation of the subject of slag action was described in last year's report. It dealt with the action of four lime-alumina silica slags on various silica, clay, and aluminous refractories, using three contrasting methods of testing. As a development of this work the corrosive action of lime itself has now been studied. For clay products the depths of corrosion (in which the brick structure is obliterated) are found to decrease roughly as the alumina contents increase, but the depths of penetration of liquid products beyond the corrosion zone are found to be at a minimum for bricks of about normal fireclay composition.

The recognised variants of the refractoriness-under-load test creep are the increasing temperature-constant load method (the usual procedure) and the maintained temperature-constant load test. An examination of these tests formed the subject of contributions to the 25th, 26th and 27th reports. A third variant, the maintained temperature-increasing load method, was considered with respect to firebrick materials in the report for last year. These products usually undergo

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increasing deformation in this type of test. In continuation of the work, a section of the present report is devoted to an examination of the behaviour of silica bricks, materials which usually fail in the test by shearing. With the products it is found that the results are subject to appreciable variation, but average values can be used with advantage to discriminate between the different brands available.

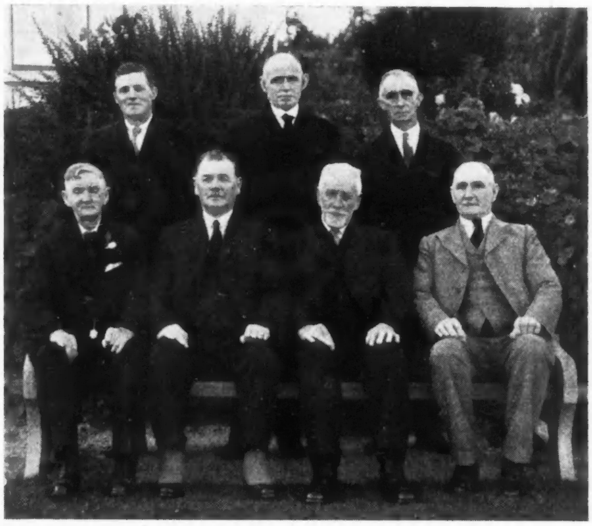
Previous reports have stressed the importance of the pressing operation in relation to the "texture" of refractory materials, particularly sillimanite and silica brick mixes. This year an investigation has been made of the variation in different parts of the pressed block of the proportioning of the various grain sizes.

In the present report accounts are also given of the measurement of apparent porosity of refractory materials by several types of procedure, and of a review of the properties of commercial cements of various types.

China Clay Industry Veterans

Rosevear Works Employees Meet at Reunion at St. Austell

AN interesting reunion of veteran workers in the china clay industry took place at St. Austell recently, when Mr. Samuel J. Dyer, works manager of the Rosevear China Clay Works at Bugle, entertained at his residence workers who had been associated with him in the Rosevear Works. The eldest of the group was Mr. G. Lobb, who is now 84 years of age, and had been employed at the Rosevear Works for about 60 years. Mr. R. Hore is 81, and has served under the Dyer family for 62 years. Mr. W. Bray, who is still working, has



The reunion at Mr. Dyer's residence :Sitting (left to right), Messrs. R. Hore, S. J. Dyer, G. Lobb and W. Bray. Standing, H. Barratt, T. Sandercock and J. Crossman.

also 60 years to his credit with the firm. The other three, Mr. J. Crossman, Mr. T. Sandercock and Mr. H. Barratt are still working, with records of service varying between 41 and 48 years. Mr. S. J. Dyer himself has been connected with the Rosevear Works for 54 years.

Eleven years ago, the works were taken over by English Clays, Lovering, Pochin and Co., Ltd. That this, the largest and most enterprising firm of producers, has every confidence in the ultimate recovery of the china clay industry is exemplified by the enormous addition the English Clays, Lovering, Pochin and Co. has just completed to their head office at St. Austell. It is now one of the largest offices in the West of England.

The Scaling Effect of Furnace Atmospheres on Mild Steel

Influence of Physical Variants and Gas Composition

EXPERIMENTS carried out to determine the scaling effect on heating a mild steel in the products of combustion of a fuel such as coal, oil or producer gas at temperatures from 1,200° C. to 1,400° C. were described in the Institution Gas Research Fellowship Report, 1936-1938, presented by A. Alan Taylor, M.Sc. Tech., and J. W. Cobb, C.B.E., B.Sc., F.I.C., at the 10th Autumn Research Meeting of the Institution of Gas Engineers. The following is a summary of the report.

Results of the Experiments

The synthetic atmosphere taken as representing these gases consisted of 10 per cent. carbon dioxide, 10 per cent. water vapour and 80 per cent. nitrogen. The influence of the presence of excess air, of a shortage of air and of sulphur dioxide in the gaseous atmosphere has been studied, as well as the effects of temperature, period of exposure and gas velocity. The following results were obtained. The critical velocity of the gases to be attained or exceeded for constant results as determined by W. E. Jominy and D. W. Murphy and by H. C. Millett and J. W. Cobb was found in their experiments to be dependent on temperature, surface area of the specimen, and composition of the atmosphere. At the high temperatures now used, it was found that for a longer time of exposure the critical velocity was smaller, and presumably it diminished as an experiment proceeded. For the shorter periods of exposure such as 5 min. used at 1,200° C. to 1,400° C., a much higher velocity had to be used than had been employed for exposures of 1 hr. at 1,000° C. The gas rate employed in subsequent experiments was 300 l. per hr., which represents a velocity of 55.8 ft. per min. at 1,200° C., 59.4 ft. per min. at 1,300° C., and 63.2 ft. per min. at 1,400° C.

At temperatures above 1,000° C. the effect of the neutral atmosphere increased greatly. Whereas at 1,000° C. the increase in weight over a 1 hr. period, as previously determined, had been 0.0075 g. per sq. cm., at 1,200° C., it was found in these experiments to be 0.0446 g. per sq. cm in $\frac{1}{2}$ hr., and at 1,300° C. scaling for $\frac{1}{4}$ hr. caused an increase of 0.0614 g. per sq. cm.

The addition of oxygen to the neutral atmosphere also caused a marked increase in the rate of scaling. Carbon monoxide reduced the scaling to some extent. The scaling effect of sulphur dioxide increased with temperature, but its effect above 1,000° C. was less marked on account of the greatly increased amount of scaling caused by the neutral atmosphere alone.

Combined Effect of Oxygen and Sulphur Dioxide

The combined effect of oxygen and sulphur dioxide at temperatures above 1,200° C. was approximately the sum of the two individual effects, whereas at lower temperatures the influence of sulphur dioxide had been found to disappear in the presence of more than 3 per cent. of oxygen. Carbon monoxide caused some reduction in the scaling effect even in the presence of sulphur dioxide, but the decrease was smaller than that produced in the absence of sulphur dioxide. The influence of varying amounts of carbon monoxide was roughly linear, but very large quantities of this gas would plainly be required to eliminate scaling completely.

The oxide scale produced in the neutral atmosphere had a melting point of 1,340° to 1,350° C. At temperatures higher than this, rapid formation of liquid scale occurred, the amount of scale being dependent on the gas velocity and directly proportional to the time of exposure. If a critical velocity exists at these temperatures it is very high. At temperatures below the melting point of the scale the effect of time on scaling could be expressed by the formula, $W^n = kt$, where W = increase in weight, t = time of exposure, k = constant and n is an index the value of which varies between 1 and 2 according to the temperature of experiment and the constitution of the atmosphere. In general, the value of n decreased with increasing concentrations of sulphur in the atmosphere, and with increasing temperature, although the effect of temperature on n was small until the scales began to show signs of fusion. Curves calculated by the use of this formula for the same time of exposure, bring out clearly the magnitude of the temperature effect on scaling.

Research on Vitamin A

Distribution of the Vitamin in Animals and its Functions.

A MEETING of the Aberdeen and North of Scotland Section of the Institute of Chemistry was held in the Chemistry Department, Marischal College, recently with Dr. A. B. Stewart in the chair, when a paper was read by Dr. J. A. Lovern, entitled "Some Recent Aspects of Vitamin A Research." Pure vitamin A has now been obtained in crystalline form and its characteristics determined, while the synthesis of impure vitamin A, starting from β-ionine, has also been accomplished, said Dr. Lovern. There is evidence of a second vitamin A, present in fish (especially fresh-water fish), but not in mammals or birds. This substance is probably the C_{22} analogue of vitamin A, with an extra double bond. Its characteristics were described and it was indicated that it can apparently function in every way like the more usual vitamin.

The distribution of vitamin A in animals was discussed, with particular reference to the storage of it in the muscular tissues of the eel and in the intestines of the halibut. It was pointed out that the vitamin is present mainly as esters rather than the free alcohol, and probably some of it is also combined with protein. The great discrepancies between the amounts present in various species of fish together with the apparent absence of the vitamin from zoo-plankton, suggest a synthetic rather than a dietary origin for much of the vitamin present in certain species. The carotenoid astacene, widely distributed amongst aquatic life, is of interest in this respect.

Diversity of function of vitamin A is evident. In addition to its role in the well-being of cells, it is specifically involved in the visual pigment cycle. Wald's work on rhodopsin and porphyropsin in fishes was discussed and the replacement of vitamin A by vitamin A_2 in fresh-water fish was mentioned. In the case of some species, such as halibut, the presence of relatively enormouus quantities (many gms.) of vitamin A suggests another, grosser function. The distribution in the alimentary tract is suggestive, nearly all the vitamin being present in a certain layer of the mucosa of the absorptive portions of the intestine. Evidence was advanced to suggest that in such species the vitamin esters might conceivably assist in the transfer of fat through the intestinal wall.

PLANS have been passed by the French Government for butyl alcohol, acetone and isopropyl alcohol manufacture from molasses by the Usine de Catenoy (Department of Oise), while the same raw material is to be used as a source of glycerine by the Usine de Courseulles-sur-Mer (Department of Calvados).

The International Patents Convention

Doubt of its Effectiveness—Need for Overhaul

AN address on "The International Conventions" was delivered by the president of the Chartered Institute of Patent Agents, Mr. William H. Ballantyne, at the opening meeting of the Institute on Wednesday.

Creation of the International Convention

He said they all knew that patent law was an artificial thing. Starting from the assumption that any manufacturer or trader was free to make and sell what he liked, the prohibitions were essentially artificial; and the patent laws of different countries as well as the laws relating to trade marks, designs and copyrights, tended to become very complex and in the late seventies they already were fairly complex. It was in the late seventies that a meeting of the group of patent lawyers, which now was known as the International Association for the Protection of Industrial Property, was held in Vienna and a concrete proposal was put forward for the creation of an international convention relating to industrial property, and particularly to patents, designs and trade marks. With remarkable rapidity the Union of 1883 was formed—"The Union for the Protection of Industrial Property"—and the document (which was in the French language and in the form of "Articles" expressing the terms of the agreement arrived at) was the document which they had referred to as the International Convention throughout the life of the Institute. As they were aware this first International Convention had been followed by a number of very similar arrangements. The mechanism for overhaul, both official and unofficial, was theoretically well provided for.

Mr. Ballantyne added: "To-day I wish to direct your minds towards a fundamental overhaul, and firstly I would ask the question 'Is the International Convention of any use at all? Is the idea on which it is based a sound one?' The second question would be 'Taking it by and large, has the Convention proved a success?' The third question would be 'Having regard to the difficulties which have arisen and the wide divergence between the practices obtaining in the Convention countries, is there any hope of creating a Convention which would be sound in principle and effective in practice?'

"The basis of the International Convention is in Article 2, which I ask you to look at:

> 'Persons within the jurisdiction of each of the countries of the Union shall, as regards the protection of industrial property, enjoy in all the other countries of the Union the advantage that their respective laws now grant, or may hereafter grant to their nationals. . : . .'

The Idea of Equal Treatment for All Non-Existent

"If this Article is not fulfilled, the Convention fails of its purpose, and while there are many who would feel that this Article has been fulfilled to some extent, no one would be rash enough to say that it has been properly fulfilled in all the countries of the Union. Do you think that the Japanese Patent Office is treating British applicants for patents or trade marks in the same way as it treats Japanese applicants: The more you consider Article 2 of the Convention in the light of the law and practice in individual countries of the Union, the more you must feel that the idea of equal treatment for all is simply non-existent. I am not going to carry you round the world to show how during the past fifty-five years different countries have failed to carry into effect the terms of the International Convention, but I do maintain that the International Convention stands in very much the same position as the Covenant of the League of Nations at the present moment, *i.e.*, that some countries do not regulate their practice in accordance with the Convention, while others do not even take the trouble to ratify its successive texts or to pass the legislation necessary to implement the convention.

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New Electric Water Still

Available in Two Sizes

A NEW design of water still of considerable interest to chemical laboratories has been introduced by the General Electric Co., Ltd.

In it the water is boiled in the lower part of the vessel, and the steam condenses on the inverted-cone shaped lid. Special means are provided to prevent the distilled water from being contaminated, and a constant water level attachment is fitted so that the still cannot boil dry so long as cooling water is flowing. The heating elements are of the resistance type and are readily replaceable. The body of the still is constructed of heavy gauge copper, tinned inside. Two sizes are available, the outputs of distilled water per hour being 4 and 8 pints respectively; the corresponding loadings are 2.4 and 4 kW.

The new G.E.C. electric water still.

(Continued from preceding column.)

The suggestion which I put forward to-day is that in these days when international questions are so largely questions of economics, the International Union should be in the same class with the Covenant of the League of Nations and that the question whether we should continue our membership of the Union and whether we should continue to give all the benefits broadcast should be looked at in just the same way as we may consider or reconsider the clauses in the Covenant of the League of Nations."

Concluding, Mr. Ballantyne declared: "It seems to me that any International Convention, to be effective, must be such that any dispute arising out of the language of the International Convention could be referred to the International Court of Justice at the Hague. There are many countries, of which this country is one, which would never agree to such a course in relation to patents, designs and trade marks, and I am wondering whether this is not the real test of our ability to remain members of the Union. The test seems to me to be this: Are we willing to agree that if any dispute should arise between one country of the Union and another country of the Union with regard to the meaning of the Convention itself, the matter should be referred to the International Court of Justice at The Hague, whose decision should be binding on the parties?

"If, as I expect, you take the natural view that we can never surrender our sovereign rights and that we shall be governed only by our national laws, then it seems to me to follow quite clearly that the provisions of the International Convention should not take effect in this country unless and until we and the other members of the Union embody these provisions in the national laws and carry the provisions into effect."

British Road Tar Association

Sir David Milne-Watson's Address on its Activities

ON the occasion of the eleventh annual meeting of the British Road Tar Association, a luncheon was held at Grosvenor House on November 3, at which Sir David Milne-Watson, the president, spoke on the activities of the Association.

Sir David said that the main activity of the Association was research and experiment. For many years they had been co-operating with the Department of Scientific and Industrial Research in laboratory investigations at the Chemical Research Laboratory at Teddington and the Road Research Laboratory at Harmondsworth, in order to learn more and more about the properties of tar and the characteristics which made an efficient road binder when used in conjunction with the various types of road stones. The acid test of a binder must always be its behaviour on the road. They had therefore, since the Association started, devoted much attention to practical road experiments in co-operation with the Ministry of Transport and surveyors in different parts of the country. As a result they had seen great advances in the quality of the tar and in the methods of application and use. Their objective was so to develop the use of tar that they were in a position to anticipate and provide for any demands the road engineer might make. In addition to its accepted qualities as an efficient non-skid material, one of the great merits of tar was its flexibility. That flexibility had at times acted to its detriment. The users had taken liberties with it which they would never have taken with a less flexible binder, and had at times got poor results, which they had attributed to the binder. The tar was not at fault, it was the method of application. Full advantage of improvements in the quality of tar could only be secured if adequate attention was given to the methods of using it. The same applied to the processes involved in coating stone for road construction. An important advance had been made by the recent issue of the first British Standard Specification for Tarmacadam. The initiative came from the Association, which had been helped by the willing co-operation from the various institutions representing the road stone industries and the road engineers and from the Ministry of Transport. The insistence on tarmacadam to this specification in all contracts would do much to raise the general level of quality.

Thin Tar Carpets Compared with Surface Dressing

"A year or two ago we saw the introduction of a new method of road improvement in the form of thin carpets, designed to restore the good riding qualities of a road which is otherwise sound," added Sir David. "We have had, and still have, some doubts as to whether this method has any economic advantage over surface-dressing. We have made a special study of thin tar carpets in order to determine the factors which are essential in their design and construction. Our specifications have been accepted by the Ministry of Transport and are at the disposal of surveyors generally.

"I have already referred to the great improvement in the quality of tar in the last few years. The result is that the existing British Standard Specifications are now out of date. The tar supplied is much better than these specifications require. We have given much attention to the problem of a new specification. We are particularly anxious that it should include tests which will indicate the characteristics of a tar necessary for an efficient road binder. As the result of co-operative work in several laboratories, a number of tests have been devised which, *prima facie,* appear to supply what we need."

Among those present at the luncheon were Messrs. J. S. Killick (Shell-Mex and B.P., Ltd.), H. E. G. West (chairman, the Association of Tar Distillers), J. B. F. Earle (vice-chairman, British Slag Macadam Federation), J. Davidson Pratt (chairman, British Road Tar Association), Dr. J. A. Robertson

(*Continued at foot of next column.*)

Society of Public Analysts

Election of Members—Abstract of Papers Read

AN ordinary meeting of the Society of Public Analysts and Other Analytical Chemists was held at the Chemical Society's Rooms, Burlington House, on November 2, the president, Professor W. H. Roberts, occupying the chair.

The following were elected members of the Society: W. J. Blackie, E. Collins, R. F. Corran, L. A. Dauncey, A. V. Delaporte, E. C. Dodds, S. Druce, J. W. E. Harrisson, S. H. Jenkins, S. Rajagopal Naidu, S. C. Ray, F. B. Richardson, R. W. Richardson, J. W. Stillman, E. T. Terry, A. L. Vale, A. G. R. Whitehouse.

The following papers were among those presented and discussed:

The Determination of Nitrogen in Mixed Fertilisers containing Nitrates and Chlorides. by Bernard Dyer and J. Hubert Hamence.—The Jodlbauer process for the determination of total nitrogen in mixed fertilisers containing nitrates is satisfactory only in the absence of chlorides. Low results may be obtained in the presence of chlorides owing to the formation of nitrosyl chloride, the nitrogen of which escapes fixation. A new method for the determination of total nitrogen in such fertilisers containing chlorides has been devised. The nitric nitrogen is first reduced to ammonia by Dovarda's alloy and sodium hydroxide in a large Kjeldahl flask, fitted with absorption bulbs containing acid; the contents of the flask are then made acid with sulphuric acid, the absorption bulbs washed out into the flask and the whole Kjeldahled. Satisfactory recoveries of nitrogen are obtained by this method, which is also applicable to the determination of total nitrogen in a mixture of calcium cyanamide and potassium nitrate.

The Determination of Acid in Wool. By J. Barritt, H. H. Bowen, F. L. Goodall and A. Whitehead.—The authors, each in a different laboratory, have collaborated in a comparative study of the sodium terephthalate method of Hirst and King, the sodium acetate distillation method of Trotman and Gee, and the pyridine method of Barritt. The first-named method gave low results and the second, although having the advantage of yielding a colourless liquid for titration, gave results which were irregular and subject to a rather erratic blank correction. The pyridine method gave the most concordant results in the hands of different operators, and recoveries of 90-100 per cent. of the acid present were obtained; difficulties in the titration of coloured extracts from dyed wools when phenolphthalein was used as indicator were overcome by the alternative use of thymol blue.

The Vitamin-A and -D Contents of Butter. II Seasonal Variation. By H. Wilkinson.—Two series of butter taken at monthly intervals, one in Scotland and the other in Denmark, have been assayed biologically for vitamin-*A* and vitamin-*D*. The typical monthly variation is shown in both series, the highest vitamin-*A* value being obtained when the cows are on grass. The variation in the vitamin-*D* potency of the Scottish butters has been related to the variation in the amount of sunshine received by the cows on pasture. The vitamin-*A* potency ranged from 8.0 to 29.9 international units per gram in the Scottish series, and from 10.8 to 56.7 u.p.g. in the Danish series. The vitamin-*D* values ranged from 0.08 to 0.99 international units per gram and from 0.08 to 0.54 u.p.g. in the Scottish and Danish samples respectively.

(*Continued from preceding column.*)

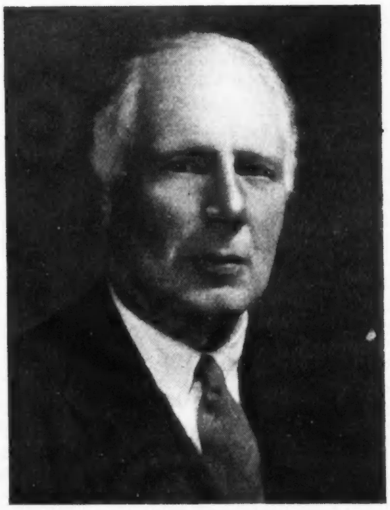
and Alderman J. H. Lloyd (vice-presidents, British Road Tar Association), Captain R. M. Walker (Shell-Mex and B.P., Ltd.), Sir Reginald Clarry, Dr. W. H. Glanville (assistant director of road research, Road Research Laboratory), E. V. Evans (chairman, Association of British Chemical Manufacturers), T. G. Marriott (Limmer and Trinidad Lake Asphalt Co., Ltd.), and H. C. Smith (past president, Institution of Gas Engineers).

Personal Notes

MR. A. C. MARSHALL, and MAJOR A. C. WIGHTMAN, the retiring directors, were re-elected at the annual meeting of the Highland Distilleries Co., Ltd., in Glasgow.

MR. THOMAS PICTON HUGHES, B.A., has been elected to an unofficial Drosier Fellowship for research in chemistry at Gonville and Caius College, Cambridge University.

MR. T. DONALDSON, delegate director of Imperial Chemical Industries, Ltd. (Explosives Group), has sailed for Australia to carry out special duties with which he has been entrusted by the board of the company.



Professor G. Barger, who has been awarded the Davy medal by the Royal Society in recognition of his distinguished researches on alkaloids and other natural products

MR. E. B. NAYLOR, M.Sc., F.I.C., for 33 years head of the chemistry department at the Wigan and District Mining and Technical College, has retired. He was the recipient of a presentation from the governors and staff.

MR. H. C. MATTHEWS was elected chairman of the Bristol Paint, Colour and Varnish Manufacturers' Association at the annual meeting of the Association on Monday. MR. NORMAN WILLS was elected to the offices of vice-chairman and hon. treasurer.

MR. J. W. KEITH, recently appointed manager of Carnoustie Chemical Works, has been elected Provost of Carnoustie. He began his career in the Carnoustie chemical works of Charles Tennant and Co., Ltd., and after spending some years in India, returned to Carnoustie and took over the management on the death of Mr. A. C. Colquhoun.

PROFESSOR NIELS BOHR has been awarded the Copley Medal by the Royal Society in recognition of his distinguished work in theoretical physics and particularly in the development of the quantum theory of atomic structure. The Hughes Medal has been awarded jointly by the Society to DR. J. D. COCKCROFT and DR. E. T. S. WALTON in recognition of their discovery that nuclei could be distintegrated by artificially produced bombarding particles.

MR. ALFRED B. SEARLE, on relinquishing the office of President of the Valuers Institution, was presented with a suitably inscribed silver salver and a document case by the Council of the Institution. The occasion was noteworthy because this is only the second time that such a presentation has been made to a retiring president. Mr. Searle is well-known as a leading authority on clays, clay products, and allied materials, but his long experience and work in connection with valuations may be less familiar to many of our readers.

MR. JAMES HEILBRONN, chairman of H. Bronnley and Co., Ltd., soap and perfumery manufacturers, left estate valued at £79,297 (net personalty £78,940).

DR. JOEL HENRY HILDEBRAND, professor of chemistry in the University of California, has been awarded the William H. Nichols Medal of the New York section of the American Chemical Society for 1939 for his study of the fundamental thermodynamic and kinetic properties of liquid and solid solutions.

OBITUARY

MR. WILLIAM PEEL, chairman of Alfreton and the South Normanton and Blackwell Gas Cos., has died at the age of 84.

PROFESSOR GEORGES URBAIN, Professor of Chemistry at the Sorbonne, and member of the Academy of Sciences, died in Paris on Sunday at the age of 66. After a short industrial experience he was appointed to the professorship at the Sorbonne in 1908, and after the war became Director of the Institute of Chemistry there. He was elected to the Academy of Sciences in 1921. He was noted for his study of complex minerals.

The funeral took place on November 3 of MR. EDWARD BROTHERTON-RATCLIFFE, founder of Brotherton-Ratcliffe and Co., Ltd., chemical merchants, Old Broad Street, London, whose death, as reported briefly in last week's issue of THE CHEMICAL AGE, occurred on October 30, at the age of 53.

Born at Gravesend and educated at Dulwich College, Mr. Brotherton Ratcliffe founded the firm which bears his name in 1918. At the time of his death, Mr. Brotherton-Ratcliffe was chairman and managing director of Brotherton-Ratcliffe and Co., Ltd., and Brotherton-Ratcliffe Holdings, Ltd., and a director of Brotherton and Co., Ltd., chemical manufacturers, Leeds; Lehn and Fink Products Corporation, America; Lysol, Ltd., London; and La Parfumerie Lesquendieu, Paris. He was appointed a director of Brotherton and Co. on the death of his uncle, Lord Brotherton, about three years ago.

The late Mr. Edward Brotherton-Ratcliffe

His brother, MR. C. E. BROTHERTON, who is chairman of Brotherton and Co., and one of the most prominent industrialists in the North, has agreed to take over the chairmanships and managing directorships of Brotherton-Ratcliffe and Co., Ltd., and Brotherton-Ratcliffe Holdings, Ltd.

AMONG the enterprises for which permits were granted during 1937 by the Greek Ministry of Trade were a tartaric acid plant, two paper works, two soap factories, a tannery, two perfume and cosmetic factories.

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Bleaching, Dyeing, Finishing

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Testing of paint and varnish products. Plowman, *J. Oil Col. Chem. Assoc.*, *21*, 311-326.

Rubber, Plastics, Resins

Mixers. Lescuyer, *Rev. Générale Caoutchouc*, *15*, 255-259.

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Theory of anticatalysis. Bauer, *Z. Phys. Chem.*, *41*, B, 179-182.

From Week to Week

THE WORKS of the Saturn Oxygen Company, Ltd., at the Scottish Industrial Estate, Hillington, Glasgow, are now in full production.

DR. FELIX SINGER, consulting ceramist has removed to Keramos House, 46 Castlemaine Avenue, South Croydon, Surrey. Telephone: Croydon 5217. Telegrams: Keramos, Croydon.

THE COPPEE COMPANY (GREAT BRITAIN), LTD., moved to new premises at North-West House, 119-125 Marylebone Road, N.W.1, yesterday (Friday). Their new telephone number is Paddington 5036.

NEW ZEALAND'S OVERSEAS TRADE FIGURES for September show that exports amounted to £3,184,000, compared with £3,902,000 for the corresponding month last year. Imports amounted to £4,821,000, against £5,403,000 last year.

THE ACHEMA IX, chemical engineering show, organised by the Dechema, German Society for Chemical Engineering, will be held at Frankfurt a.M., from June 28 to July 7, 1940, on the occasion of the general meeting of German chemists and of the 2nd International Chemical Engineering Congress.

A BRONZE PLAQUE TO COMMEMORATE THE 50TH ANNIVERSARY of the invention of the pneumatic tyre by John Boyd Dunlop, will be unveiled at Fort Dunlop, Birmingham, on November 18, by Sir George Beharrell, chairman of the Dunlop Rubber Company. The plaque has been designed by the Birmingham Guild.

THE GEIGY COLOUR COMPANY, LTD., have marketed an addition to their range of Polar Brilliant Red—Polar Brilliant Red BN Conc. It is claimed to be richer and brighter and slightly bluer than the older Polar Brilliant Red B Conc. brand, and to possess equally good general fastness properties with the additional property of very good fastness to alkali.

THE SCOTTISH SHALE OIL INDUSTRY is to be developed by Scottish Oils, Ltd., a subsidiary of the Anglo-Iranian Oil Co., Ltd., in which the Government owns 50 per cent. of the shares and has two directors on the board. The Government's encouragement of the native production of oil is prompted by the importance of oil in the event of a crisis.

THERE WERE 12,294,000 insured persons at work in Great Britain on October 17, according to figures issued by the Ministry of Labour on Monday. This is 23,000 more than on September 12. In the textile bleaching, printing and dyeing and the artificial silk yarn manufacture industries there were decreases in unemployment of 1,722 and 1,660 respectively, compared with the position on September 12.

AT A CONVERSAZIONE HELD on Tuesday evening at the Royal Geographical Society on the occasion of the formal inauguration of the Institute of Petroleum, Mr. G. W. Lepper, technical adviser to H.M. Petroleum Department, related the story of the search for oil in Britain since 1914 up to the present time. He pointed out that there was no way known to science, apart from the test of the drill, by which the presence of commercial accumulations of oil could be predicted with certainty.

THE ENGINEERING PUBLIC RELATIONS COMMITTEE has arranged with Mr. C. L. Howard Humphreys, T.D., M.Inst.C.E., to present a paper on "The Engineer's Contribution to the Public Health Services" at the Public Health Services Congress, at the Royal Agricultural Hall, Islington, N.1, on Friday, November 18, at 11 a.m. Mr. R. H. Bernays, M.P., Parliamentary Secretary, Ministry of Health, will be in the chair and will be supported by the president of the Institution of Chemical Engineers and the presidents of a number of other bodies.

THE 43RD BEDSON LECTURE was delivered recently in the Chemistry Lecture Theatre of Kings College, Newcastle-upon-Tyne, by Professor Max Born. Professor Born explained the use of the methods of probability in physics and chemistry in general and with particular reference to the theory of van der Waal's forces, which theory, he contended, had been recently much improved by some papers of T. E. Mayer (Baltimore). He added some remarks upon the work of Leonard Jones on the critical point, and concluded by referring to modern quantum statistics and their applications.

THE PROGRAMME of meetings for the forthcoming season of the various chemical societies in Birmingham and the Midlands has just been issued under the auspices of the Midland Chemists Committee. The officers of the Midland sections of the various societies for this season are: Society of Chemical Industry, chairman, Mr. G. Dring; hon. secretary, Mr. G. King; Institute of Chemistry: chairman, Mr. J. R. Johnson; vice-chairman, Mr. T. H. Gant; hon. secretary, Mr. Garfield Thomas; British Association of Chemists: chairman, Mr. A. Churchman; hon. secretary, Mr. J. K. Best; Chemical Society: local representative, Dr. S. Peat; Birmingham University Chemical Society: president, Professor W. N. Haworth; hon. secretary, Mr. G. A. Jeffery; Midland Chemists Committee, president, Mr. W. A. S. Calder; chairman, Mr. A. Churchman; hon. secretary, Mr. G. King.

LISSAMINE RED 7 BPS is an addition to the I.C.I. range of acid dyes which gives a shade rather bluer and brighter than that of the established Lissamine Red 6 BS. It is also claimed that it gives better fastness to washing and perspiration than the usual level dyeing acid reds.

THE 21ST EDITION OF VOLUME II OF THE EXTRA PHARMACOPOEIA will be published on November 15. It is thoroughly revised, with many new sections, and increased in size by one-third. The published price of volume II remains the same at 22s. 6d. (trade price for single copies 18s. 9d.).

THE TREASURY have made an Order under Section 10 (5) of the Finance Act, 1926, exempting caesium bromide from Key Industry Duty from November 9, 1938, until December 31, 1939. The Treasury Order, which will be entitled The Safeguarding of Industries (Exemption) No. 5 Order, 1938, will shortly be published by H.M. Stationery Office.

THE SCOTTISH BEET SUGAR CAMPAIGN officially opened last week, and will last approximately eight weeks during which the factory at Cupar will work 34 hours on a basis of three shifts a day for seven days a week. Over 2,000 tons of beet are already available. Last week Mr. Colville, Secretary of State for Scotland, gave an assurance that the Cupar factory, about the future of which there has been uncertainty, will continue to operate for five years and after that on condition that the acreage is raised from about 8,000 acres to at least 10,000 acres and that the factory overhead costs are reduced.

THE ANNUAL CHEMICAL DINNER AND DANCE will be held at the Connaught Rooms, Great Queen Street, Kingsway, W.C.2, on Tuesday, November 22. Members and registered students from the Chemical Society, Institute of Chemistry, Society of Chemical Industry, Society of Public Analysts, Faraday Society, Biochemical Society, Society of Dyers and Colourists, Ceramic Society, Institution of Chemical Engineers, Institute of Petroleum Oil and Colour Chemists' Association, Association of British Chemical Manufacturers, British Association of Chemists and the Chemical Club, are invited to apply for tickets, 12s. 6d. each, to Mr. F. A. Greene, The Chemical Club, 2 Whitehall Court, London, S.W.1, not later than November 16.

Company News

Eagle Chemicals, Ltd., have increased their nominal capital by the addition of £500, beyond the registered capital of £500.

Borax Consolidated, Ltd., have decided to pay an interim dividend of 3 per cent., less tax, on the preferred ordinary stock in respect of year ended September 30, 1938.

Lewis Berger and Sons, Ltd., have declared a final ordinary dividend of 9 per cent., making a total of 15 per cent., against 16 per cent. last year. Preliminary figures show net profits of £136,218 for year to July 31, a reduction of £20,839.

Leeds Fireclay report a profit for the year ended June 30, of £67,479 (against £55,562), to which is added £23,430 brought forward, making £90,909. A dividend of 5 per cent. (against 4 per cent.) on the ordinary shares is recommended.

Beechams Pills, Ltd.—At an extraordinary general meeting held on Thursday, a resolution was passed to increase the capital of the company by the creation of 4,000,000 Deferred Shares at 2s. 6d. each, of which 2,500,000 are required for the purpose of exchange for the 4,000,000 5s. Ordinary Shares of Eno Proprietaries, Ltd.

The International Nickel Company of Canada, Ltd., report a net profit of $7,552,123, equivalent to 48 cents per share on the common stock after allowing for preferred dividend, for the third quarter of 1938. This compares with a net profit of $6,618,486 for the previous quarter, equal to 42 cents per share. Net profit for the first nine months of 1938 was $24,284,374 (against $38,944,380), or $1.56 per share (as against $2.57 a year ago). The consolidated balance sheet at September 30, 1938, shows current assets at $78,963,931, including $39,584,573 in cash.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Canada.—A firm of agents established at Toronto wishes to obtain the representation, on a purchasing or consignment basis, of United Kingdom manufacturers or exporters of oleic acid, lima beans and other vegetable products for Canada. (Ref. No. 324.)

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PRODUCTION OF MONOBASIC ALUMINIUM SULPHITE.—T. Goldschmidt, A.-G., and Vereinigte Aluminium-Werke, A.-G. (Germany, Nov. 3, '37.) 30884.

PRODUCTION OF HIGH GRADE, ETC., ALUMINA from monobasic aluminium sulphite.—T. Goldschmidt, A.-G., and Vereinigte Aluminium-Werke, A.-G. (Germany, Nov. 3, '37.) 30886.

PYRIDINE DERIVATIVES.—I. M. Heilbron, J. W. Haworth, D. H. Hey, and Imperial Chemical Industries, Ltd. 30831.

MANUFACTURE OF NITROGENOUS CONDENSATION PRODUCTS, ETC.—I. G. Farbenindustrie. (Germany, Oct. 28, '37.) 30356.

COMPOSITIONS FOR TREATING SOIL.—Imperial Chemical Industries, Ltd. (Germany, Oct. 20, '37.) 30411.

PLASTICISING OF POLYMERIC ORGANIC SULPHIDES.—Imperial Chemical Industries, Ltd. (United States, Oct. 22, '37.) 30754.

PROCESS FOR THE REMOVAL OF MERCAPTANS from mercaptide solutions.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Nov. 15, '37.) 30542.

PRODUCTION OF ALLOYS.—J. E. Pollak (Richardson). 30969.

PREPARATION OF A TRISUBSTITUTED BARBITURIC ACID.—J. D. Riedel-E. de Haen, A.-G. (Germany, Oct. 28, '37.) 30479.

PRODUCTION OF PHOSPHATE FERTILISERS.—Röchling'sche Eisen und Stahlwerke Ges. (Germany, Oct. 23, '37.) 30615.

PRODUCTION OF WHITE CELLULOSE COMPOUND from a non-fibrous waste material, etc.—C. Ruzicka, and C. V. Sale. 30967.

REDUCTION OF IRON ORES, ETC.—Sachtleben, A.-G. für Bergbau und Chemische Industrie. (Germany, Oct. 6, '37.) 30731.

MANUFACTURE OF TERTIARY ALCOHOLS of the oestrane series, etc. Schering, A.-G. (Germany, Oct. 25, '37.) 30552.

MANUFACTURE OF COMPOUNDS OF CYCLOPENTANO-POLYHYDROPHENANTHRENE SERIES.—Schering, A.-G. (Germany, Oct. 27, '37.) 31013.

REGENERATING VULCANISED RUBBER, ETC.—Soc. Hydro-Electrique and Industrielle du Morvan. (Germany, Nov. 23, '37.) 30515.

MANUFACTURE OF INDIGOID VAT DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, Oct. 22, '37.) 30349; (Switzerland, Oct. 5.) 30350.

MANUFACTURE OF SUBSTANCES WHICH AFFECT THE BLOOD PRESSURE. Soc. of Chemical Industry in Basle. (Switzerland, Oct. 23, '37.) 30351; (Switzerland, Oct. 1.) 30352.

MANUFACTURE OF CARBONYL COMPOUNDS OF THE CYCLOPENTANOPOLYHYDROPHENANTHRENE SERIES.—Soc. of Chemical Industry in Basle. (Switzerland, Oct. 25, '37.) 30353; (Switzerland, Sept. 28.) 30354.

MANUFACTURE OF UNSATURATED STEROID KETONES.—Soc. of Chemical Industry in Basle. (Switzerland, Nov. 1, '37.) 30490.

PRODUCTION OF ARSENATES.—J. B. Stalhane. 30575.

MANUFACTURE OF ALKYL PHENOLS.—W. J. Tennant (Dow Chemical Co.). 30546.

ALKALI CELLULOSATES, ETC.—W. J. Tennant (Dow Chemical Co.). 30547.

METHOD OF SEPARATING PHENOLS from aqueous alkaline liquors containing same.—W. J. Tennant (Dow Chemical Co.). 30721.

PROCESS FOR PRODUCING HEMICELLULOSE-POOR VISCOSE and solid artificial structures therefrom.—Vereinigte Glanzstoff-Fabriken, A.-G. (Germany, Oct. 23, '37.) 30611.

CARBON BLACKS.—W. Baird, J. R. S. Waring, and Imperial Chemical Industries, Ltd. 31246.

TREATMENT OF POLYMERISED CHLOROPRENE.—B. B. Chemical Co., Ltd., L. E. Puddefoot, and J. A. Wilson. 31386.

MANUFACTURE OF INTERMEDIATE COMPOUNDS in the production of hormones.—British Drug Houses, Ltd., and P. G. Marshall. 31316.

METHOD, ETC., FOR INJECTION MOULDING of vinyl resins.—Carbide and Carbon Chemicals Corporation. (United States, Nov. 11, '37.) 31031.

METHOD, ETC., OF DETECTING, ETC., CONTAMINATION by chemical warfare substances.—Chema Akciova Spolecnost. (Czecho-Slovakia, Oct. 30, '37.) 31362.

PROCESS, ETC., FOR SOFTENING WATER.—Chemical Engineering and Wilton's Patent Furnace Co., Ltd., and N. Wilton. 31742.

PROCESS FOR THICKENING THE ELECTROLYTES OF GALVANIC ELEMENTS, ETC.—Chloride Electrical Storage Co., Ltd. (Germany, Jan. 14.) 31703.

MANUFACTURE OF TUBE BENDS from thermoplastic material.—Deutsche Celluloid-Fabrik, A.-G. (Germany, Nov. 5, '37.) 31718.

METHOD OF PLASTICISING SYNTHETIC, ETC., RUBBER IN DISPERSIONS.—Deutsche Dunlop Gummi Cie, A.-G. (Germany, Oct. 27, '37.) 31118.

MANUFACTURE OF SYNTHETIC MINERAL PRODUCTS.—W. Diterichs. (Luxembourg, Oct. 30, '37.) 31233.

SULPHURISED HYDROCARBON PRODUCTS, ETC.—E. I. du Pont de Nemours and Co., and P. La F. Magill. 31471.

METHOD, ETC., OF TREATING GASES.—Fansteel Metallurgical Corporation. (United States, Nov. 15, '37.) 31562; (United States, Oct. 17.) 31563.

ORGANIC CONDENSATION PRODUCTS, ETC.—E. I. du Pont de Nemours and Co., W. E. Lawson, and C. P. Spaeth. 31139.

METHOD OF MANUFACTURING STABLE SALTS of acetyl-salicylic acid.—G. M. Dyson. 31231.

STEEL ALLOYS.—General Motors Corporation. (United States, Jan. 6.) 31214.

COLOURING ACETATE ARTIFICIAL SILK.—C. H. Giles, R. S. Horsfall, H. A. Thomas, and Imperial Chemical Industries, Ltd. 31245.

COMPOSITE PIGMENTS, ETC.—Glidden Co. (United States, Nov. 18, '37.) 31224.

HEAVY METALLIC SALTS of fluorescein, etc.—A. G. Green. 31389.

METHODS, ETC., FOR STERILISATION OF LIQUIDS.—H. G. Hoare. 31745.

OPENING UP OF ZIRCONIUM ORES.—I. G. Farbenindustrie. (Germany, Oct. 30, '37.) 31359.

MANUFACTURE, ETC., OF SYNTHETIC TANNING AGENTS.—I. G. Farbenindustrie. (United States, Oct. 30, '37.) 31450, 31451.

MANUFACTURE, ETC., OF WETTING AGENTS.—G. W. Johnson (I. G. Farbenindustrie.) (April 9, '37.) 31613, 31614.

PLASTICISING RUBBER.—M. Jones, C. F. Flint, and Imperial Chemical Industries, Ltd. 31140.

PRODUCTION OF STEEL.—Kohle-und Eisenforschung Ges., E. H. Schulz, and H. Scholz. 31491.

HYDROGENATION OF UNSATURATED HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). 31128.

METHOD OF IMPROVING THE STABILITY OF ALKALINE SOLUTIONS containing azo dyestuff components of an exclusively phenolic nature.—Naamlooze Vennootschap Chemische Fabriek L. van der Grinten. (Holland, Nov. 5, '37.) 31645.

REMOVING WEAKLY ACID-REACTING SUBSTANCES from hydrocarbons, etc.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Canada, Dec. 22, '37.) 31130.

PREPARATION OF DERIVATIVES OF p-AMINO-BENZENESULPHONAMIDE. Naamlooze Vennootschap Orgachemia. (Holland, Oct. 29, '37.) 31282.

HARD-METAL ALLOYS.—H. Peterson. (July 6.) 31699.

MANUFACTURE OF LUMINESCENT SCREENS.—R. Puleston. 31692.

PRODUCING CATALYSTS FOR BENZINE SYNTHESIS.—Ruhrchemie, A.-G. (March 24, '37.) (Germany, April 1, '36.) 31293.

MANUFACTURE OF pp^1-DIAMINO-DIPHENYL-SULPHONE, ETC.—Schering, A.-G. (Germany, Nov. 1, '37.) 31511.

TREATMENT OF RAW MATERIALS containing calcium phosphate.—W. Siegel. 31524.

METHOD OF MANUFACTURING MEDICAL COMPOUNDS.—P. E. Snell. 31026.

MANUFACTURE OF $N:N^1$-DIALKYL-DIPYRAZOLANTHRONYLS.—Soc. of Chemical Industry in Basle. (July 30, '37.) (Switzerland, July 30, '36.) 31717.

DYEING OF CELLULOSE DERIVATIVES, ETC.—Soc. Rhodiaceta. (Germany, Nov. 1, '37.) 31109.

MANUFACTURE OF CO-POLYMERS.—Standard Oil Development Co. (United States, Dec. 29, '37.) 31501.

METHOD OF PURIFYING LUBRICANTS.—Standard Oil Development Co. (United States, Dec. 31, '37.) 31604.

EXTRACTING SUGAR FROM MOLASSES by dialysis.—Sylvania Industrial Corporation. (United States, Oct. 28, '37.) 31192.

MANUFACTURE OF SYNTHETIC CONDENSATION, ETC., PRODUCTS.—Tootal Broadhurst Lee Co., Ltd., and F. C. Wood. 31665.

Complete Specifications Open to Public Inspection

COATING OF FERROUS METAL WITH A WATER-INSOLUBLE METALLIC PHOSPHATE.—American Chemical Paint Co. April 30, 1937. 23669/37.

MANUFACTURE OF OXIDATION PRODUCTS FROM STEROLS or bile acids.—Soc. of Chemical Industry in Basle. April 28, 1937. 32908/37.

PREPARING DERIVATIVES OF AROMATIC AMINO-SULFAMIDES.—R. T. Richter Gedeon Vegyeszeti Gyar. April 29, 1937. 6329/38.

HARDENING CASEIN FIBRES.—I. G. Farbenindustrie. April 27, 1937. 7505/38.

REGENERATING FUSED SALTPETRE BATHS used for the heat treatment of metals or alloys.—I. G. Farbenindustrie. April 27, 1937. 9507/38.

PRODUCING MOLYBDENUM containing alloys.—Climax Molybdenum Co. April 28, 1937. 9890/38.

PROCESSES OF CONCENTRATING MINERALS from their ores.—Phosphate Recovery Corporation. April 27, 1937. 11035/38.

REFINING PHEONALS.—Deutsche Erdol, A.-G. April 27, 1937. 11197/38.

ALKALINE DETERGENT COMPOUNDS.—Griffith Laboratories, Inc. April 30, 1937. 11976/38.

ALLOY STEEL.—Sandvikens Jernverks Aktiebolag. April 30, 1937. 12369/38.

HYDROLYTIC PRECIPITATION OF TITANIUM COMPOUNDS and the manufacture of titanium pigments.—Titanges. April 29, 1937. 12017/38.

SEPARATION OF DIHYDRO-EQUILIN and oestradiol.—Schering, A.-G. April 30, 1937. 12448/38.

DYEING.—I. G. Farbenindustrie. April 27, 1937. 12460/38.

MANUFACTURE OF SUBSTITUTED ANTHRAQUINONES and aroylbenzoic acids.—I. G. Farbenindustrie. April 27, 1937. 12575/38.

MANUFACTURE OF POLYMERISATION PRODUCTS.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. April 28, 1937. 12576/38.

CORROSION-RESISTANT ALLOYS.—British Thomson-Houston Co., Ltd. April 30, 1937. 12635/38.

METHOD OF MANUFACTURING REFRACTORIES.—Oesterreichisch Amerikanische Magnesit, A.-G. April 28, 1937. 12636/38.

SYNTHETIC RUBBER COMPOUNDS.—British Thomson-Houston Co. Ltd. April 30, 1937. 12723/38.

PRODUCTION OF ORGANIC COMPOUNDS.—Kodak, Ltd. April 28, 1937. 12786/38.

UREA FORMALDEHYDE RESINS.—Resinous Products and Chemical Co. April 30, 1937. 12835/38.

HEAT TREATMENT OF ALUMINIUM BASE ALLOYS.—E. H. Dix, and J. A. Nock. April 30, 1937. 12854/38.

PROCESS FOR PRODUCING CATALYSTS for benzine synthesis.—Ruhrchemie, A.-G. April 1, 1936. 31293/38.

Specifications Accepted with Date of Application

SURFACE TREATMENT OF IRON AND STEEL.—H. Davies. Jan. 25, 1937. 494,503.

METHOD FOR THE PREPARATION OF TERPENE ETHERS.—Hercules Powder Co. Feb. 15, 1936. (Samples furnished.) 494,504.

PRODUCTION OF SPONGY PRODUCTS OF RUBBER and rubber-like material.—J. A. Talalay. Feb. 22, 1937. 494,336.

METHOD FOR THE PREPARATION OF TERPENE ETHERS.—Hercules Powder Co. March 7, 1936. (Samples furnished.) 494,506.

POLYMERISATION OF ORGANIC COMPOUNDS.—Distillers Co., Ltd., H. M. Stanley, and H. P. Staudinger. March 23, 1937. (Samples furnished.) 494,575.

PREPARING MONOHYDRIC ALCOHOLS.—W. W. Triggs (Armour and Co.). March 24, 1937. 494,666.

PROCESS FOR THE MANUFACTURE OF PAPERBOARD FROM STRAW with the simultaneous production of furfuraldehyde.—W. J. Tennant (Henkel and Cie. Ges.). March 25, 1937. 494,669.

MANUFACTURE OF ARTIFICIAL RESINS.—W. W. Groves (I. G. Farbenindustrie.) April 23, 1937. 494,581.

MANUFACTURE OF COMMINUTED CALCIUM CARBIDE.—A.-G. Fur Stickstoff-Dunger. May 19, 1936. 494,515.

PRODUCTION IN A PURE STATE of easily polymerisable organic compounds.—Rohm and Haas, A.-G. April 29, 1936. 494,520.

MANUFACTURE OF SYNTHETIC RESINS.—E. I. du Pont de Nemours and Co. April 28, 1936. 494,681.

MANUFACTURE OF COUPLING COMPONENTS and azo-dyestuffs therefrom.—A. Carpmael (I. G. Farbenindustrie.) April 28, 1937. (Samples furnished.) 494,423.

PRODUCTION OF UREA-ALDEHYDE SYNTHETIC RESINS.—E. I. du Pont de Nemours and Co. May 1, 1936. 494,700.

HETEROCYCLIC COMPOUNDS.—C. E. Dent, and Imperial Chemical Industries, Ltd. April 30, 1937. 494,738.

ELECTROLYTIC PRODUCTION OF ALKALINE-EARTH METALS or alloys thereof with base metals.—A. R. Gibson. May 4, 1937. 494,702.

HEAT-TREATMENT OF LIGHT METALS and their alloys.—G. Siebert Ges. June 3, 1936. 494,434.

ACCELERATORS OF VULCANISATION.—Wingfoot Corporation. Sept. 3, 1936. 494,602.

METHOD FOR SYNTHETICALLY PREPARING AN ESTROGENIC COMPOUND. Parke, Davis and Co. Aug. 6, 1936. 494,441.

METHOD OF PRODUCING FURFURAL and organic acids.—Naamlooze Vennootschap Internationale Suiker en Alcohol Cie, International Sugar and Alcohol Co., Isaco., and E. Farber. Aug. 4, 1937. 494,611.

MANUFACTURE OF HYDROGEN PEROXIDE.—Naamlooze Venootschap Industrieele Maatschappij Voor Noury and van der Lande. Aug. 14, 1936. 494,370.

MANUFACTURE AND PRODUCTION OF SULPHONATION PRODUCTS.—I. G. Farbenindustrie, and Standard Oil Development Co. Sept. 23, 1936. 494,616.

PURIFICATION OF WAX obtained from peat.—J. Reilly, D. F. Kelly, D. J. Ryan, and E. Boyle. April 10, 1937. 494,449.

REMOVING ACID COMPONENTS FROM HYDROCARBONS or derivatives thereof.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 28, 1936. 494,450.

REMOVING ACID COMPONENTS FROM HYDROCARBONS or derivatives thereof.—Naamlooze Vennootschap de Bataafsche Petroleum Mattschappij. Feb. 8, 1937. 494,451.

METHOD OF PRODUCING HARD CEMENTED CARBIDE.—G. J. Comstock. Oct. 1, 1937. 494,705.

BASIC CONDENSATION PRODUCTS.—Chemical Works, formerly Sandoz. Nov. 10, 1936. 494,625.

PROCESS FOR THE MANUFACTURE OF A SODIUM SILICATE-CONTAINING PRODUCT and the resulting product.—Pennsylvania Salt Manufacturing Co. March 18, 1937. 494,628.

BITUMINOUS EMULSIONS.—D. Frunzetti. Feb. 1, 1937. 494,380.

MANUFACTURE OF DISPERSING AGENTS.—H. Schou. Jan. 20, 1938. 494,639.

VULCANISATION OF RUBBER.—Wingfoot Corporation. May 28, 1937. 494,385.

PRODUCTION OF METALLIC MAGNESIUM.—Magnesium Elektron, Ltd. April 5, 1937. 494,386.

HYDROGEN-SULPHIDE RECOVERY.—Non Ferrous Metal Products. Ltd. April 1, 1937. 494,390.

PRODUCTION OF BUTANDIOL-1 :3.—Consortium Fur Elektrochemische Industrie Ges. Feb. 24, 1937. 494,391.

MANUFACTURE OF ENOLIC ETHERS of ketocyclopentanopolyhydrophenanthrene compounds.—Schering, A.-G. Feb. 26, 1937. 494,484.

MANUFACTURE AND PRODUCTION OF ALKALI METAL HYPOSULPHITES. I. G. Farbenindustrie. March 15, 1937. 494,556.

PRODUCTION OF AZO DYESTUFFS.—J. R. Geigy, A.-G. March 19, 1937. 494,646.

PROCESS OF MANUFACTURING ALUMINIUM SULPHATE FROM KAOLIN. N. Martinet, C. Bogdanoff, and Soc. A. R. L. Laboratoire Ege. March 24, 1938. 494,490.

MANUFACTURE AND PRODUCTION OF LUBRICATING-OILS.—I. G. Farbenindustrie. April 24, 1937. 494,657.

METHOD OF REMOVING MAGNESIUM from mechanical mixtures of metallic beryllium and metallic magnesium.—I. G. Farbenindustrie. July 1, 1937. 494,662.

Chemical and Allied Stocks and Shares

DESPITE the commencement of a new Stock Exchange account the stock and share markets have not been very active, although the undertone of markets was steady, and, following the Prime Minister's speech concerning trade conditions, improved demand was reported for a number of industrial shares.

Among securities of companies associated with the chemical and kindred industries Imperial Chemical were in request around 31s. 3d., while Murex at 77s. 6d. have held their recent improvement. British Oxygen at 71s. 10½d., and British Aluminium at 53s., were also unchanged on balance for the week. Fison Packard and Prentice at 38s. 9d. are now "ex" the dividend and are within 3d. of the price ruling a week ago. Turner and Newall attracted attention on hopes that the dividend for the year may again be 20 per cent. Tube Investments were better, pending publication of the report and accounts, while Lever and Unilever at 36s 9d., have moved up in advance of the interim dividend declaration.

Swedish Match were again active, and at 29s. 3d. have held their recent rise, there being growing hopes that the shares will return to the dividend list next year. Triplex Glass shares fluctuated, but at 33s. are slightly above the price ruling a week ago. Demand was in evidence for Associated Cement and British Portland Cement, while Tunnel Cement were also better on attention drawn to the large amount of cement that will probably be required for A.R.P. and similar work. British Plaster Board were higher at 26s. 4½d., there being continued hopes that the interim dividend may be unchanged at 20 per cent. Dorman Long ordinary have been steady, pending the dividend announcement, while United Steel, Consett Iron, Staveley, Stanton, Stewarts and Lloyds and various other iron, steel and allied shares were inclined to make better prices.

Pinchin Johnson were higher at 26s. 4½d., and Lewis Berger were fairly steady despite the small "cut" in the dividend. International Paint, Indestructible Paint and Wall Paper deferred shares were little changed. The report and accounts of the latter company are expected shortly. Imperial Smelting have made a higher price on further consideration of the statements at the meeting; the market is very hopeful that the ordinary shares will return to the dividend list next year. Enfield Rolling Mills continued active, in advance of the past year's results. Borax Consolidated have been firm on the decision to resume interim payments on the preferred shares, which has been taken as an indication that the company's profits are continuing to run at a satisfactory level.

Boots Pure Drug at 39s. 9d. are within 6d. of the price current a week ago. Beechams Pills deferred shares remained around 8s., and Timothy Whites and Taylors were little changed at 23s. 4½d., while British Drug Houses remained around 21s. Greeff-Chemicals Holdings 5s. units were quoted around 6s. Michael Nairn improved to 58s. 9d., and Barry and Staines to 36s. 3d. British Celanese lost most of their recent improvement, awaiting the results. Various leading textile shares attracted rather more attention.

Oil shares moved closely with the day-to-day trend of the Stock Exchange, and Anglo-Iranian, "Shell" and other leading securities in this section were inclined to improve later in the week. International Nickel were better in common with most dollar shares.

Weekly Prices of British Chemical Products

A STEADY trade is maintained in most sections of the chemical market and the general movement is considered satisfactory. Deliveries under existing contracts are being called for in good quantities and the volume of inquiry for fresh contract business is certainly not below the normal for the period. There are no items that call for particular comment and values remain steady with no important price changes to record. The market in coal tar products continues inactive with dealers displaying little or no interest. Crude carbolic acid is a little lower and creosote is again weaker. In the majority of cases dealers are content to mark time, it being generally felt that sooner or later rates must move in favour of holders.

Price Changes

Rises: Copper Sulphate (Manchester).

Falls: Pitch (Manchester).

MANCHESTER.—The demand for heavy chemical products in the Manchester market during the past week has been on quietly steady lines, with the bulk of the business reported concerned with near delivery positions. Sellers are anticipating an early quickening of the pace in forward bookings as the general price position in respect of next year's deliveries becomes known. In the meantime, supplies against existing contracts are moving into consumption fairly well, with a continued slight improvement in textile and allied chemicals. With regard to the tar products generally quiet conditions have been experienced this week and occasionally lower prices are being indicated.

GLASGOW.—There has been no change in the general chemical market position during the week, the demand both for home and export remaining quiet. Prices continue quite firm at about previous figures.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 10s. per ton f.o.b. SCOTLAND: £19 per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled. 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5½d. per lb., net, carriage paid.

POTASSIUM IODIDE —B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9½d. to 11½d.

POTASSIUM PRUSSIATE.—6½d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot. £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks. £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 15s.

SODIUM BISULPHITE POWDER.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts.

SODIUM CHROMATE.—4¼d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4¼d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9¾d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

SODIUM PRUSSIATE.—[illegible]d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5¼d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1¼d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—3s. 6d. to 3s. 9d. per lb.

CARBON BLACK.—3⅜d. to 4 1/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11½d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4⅜d. to 5¼d. per lb.; dark 3¾d. to 4½d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 8d. per gal.; crude, 1s. per gal.

CARBOLIC ACID.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

CREOSOTE.—Home trade, 4d. per gal., f.o.r. makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 3¾d. to 4½d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

CRESYLIC ACID.—97/99%, 1s. 9d. to 2s.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%. 2s. 1d. to 2s. 3d.; Dark, 95%, 1s. 7d. to 1s. 8d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification. 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 1s. 10d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £11 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £12 to £13 per ton f.o.b.

PITCH.—Medium, soft, 31s. per ton, f.o.b. MANCHESTER: 31s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade 35s.

PYRIDINE.—90/140%, 12s. to 13s. per gal.; 90/160%, 9s. 8d. to 11s. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 10s. to 12s. per gallon.

TOLUOL.—90%, 1s. 10d. per gal.; pure 2s. 2d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal MANCHESTER: Pure 2s. 4d. per gallon, naked.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 5s. to £8 10s. MANCHESTER: Brown, £8s. 10d.; grey, £9 15s.

METHYL ACETONE.—40.50%, £32 to £35 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.

WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—7¼d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

a-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 2s. 1d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Forthcoming Events

London

November 14-19.—Public Health Services Congress and Exhibition. Royal Agricultural Hall.

November 14.—Institution of the Rubber Industry. Northumberland Rooms, Northumberland Avenue, W.C.2. 7.30 p.m. S. A. Brazier, "Are Quality Specifications for Rubber Goods Necessarily Unsatisfactory?"

November 16.—Institute of Chemistry (London and South-Eastern Counties Section). Annual General Meeting and Smoking Concert. Palace Hotel, Bloomsbury Street, W.C.1. 7.30 p.m.

November 17.—Chemical Society. Burlington House, Piccadilly, W.1. 8 p.m. Professor W. N. Haworth, "Some Carbohydrate Problems."

The Royal Society. 10.30 a.m. Discussion opened by Professor Th. Svedberg, on the protein molecule.

November 18.—Institute of Chemistry. 30 Russell Square, W.C.1. 8 p.m. 21st Streatfeild Memorial Lecture. J. R. Nicholls, "Opium."

Oil and Colour Chemists' Association. Joint Meeting with the International Society of Leather Trades' Chemists (British Section). Federation of British Industries, Tothill Street, S.W.1. 7.30 p.m. Discussion on Pigment Finishes.

November 21.—Royal Society of Arts, John Street, Adelphi, W.C.2. 8 p.m. Cantor Lecture. J. H. Partridge, "Refractory Materials."

Chemical Club. 2 Whitehall Court, S.W.1. 8.15 p.m. Dr. I. Frost, "Some Modern Approaches to Problems of Psychiotry."

November 22.—University of London. 5 p.m. Dr. L. Margaret Kerly, "Muscle Chemistry."

Institute of the Plastics Industry. Caxton Hall, Westminster, S.W.1. 7.30 p.m. R. Cottrell-Butler, "Plastics and Architecture."

Annual Chemical Dinner. Connaught Rooms, Great Queen Street, W.C.2. 7.30 p.m.

November 23.—Association of Scientific Workers. University College, Gower Street, W.C.1. 8.15 p.m. Professor W. C. Cullis, "The Film in Education."

Belfast.

November 19.—Institute of Chemistry. Annual dinner at the Grand Central Hotel.

Birmingham.

November 14.—Society of Chemical Industry. Joint meeting with the University Chemical Society. University Buildings, Edgbaston. 5.30 p.m. Dr. E. G. Cox, "X-ray Studies on Cellulose and Other Carbohydrates."

November 15.—Institute of the Plastics Industry. James Watt Memorial Institute, Great Charles Street. 8 p.m. Major T. Knowles, "Industrial Tendencies and the Export Trade."

Dublin.

November 23.—Institute of Chemistry. Annual general meeting. University College, Upper Merrion Street. 8 p.m.

Glasgow.

November 18.—Society of Chemical Industry. Joint meeting with the Chemical Society. Royal Technical College, 204 George Street. 7.30 p.m. J. Monteath Robertson, "The Hydrogen Bond."

Huddersfield.

November 21.—Institute of Chemistry. Dr. C. Ainsworth Mitchell, "Identifications in Criminology."

Hull.

November 15.—Hull Chemical and Engineering Society. Municipal Technical College, Park Street. 7.45 p.m. N. D. Pullen, "Modern Developments in the Aluminium Industry."

Leeds.

November 21.—Institute of Chemistry. Annual general meeting. Dr. J. J. Fox, "Some Infra-Red Themes."

Liverpool.

November 18.—Institute of Chemistry. Joint meeting with the Liverpool Section of the Society of Chemical Industry. The University. 6 p.m. Dr. B. A. Southgate, "The Discharge of Crude Sewage into the Estuary of the River Mersey."

Manchester.

November 14.—Institute of the Plastics Industry. Engineers' Club, Albert Square. 7.30 p.m. Dr. F. Riesenfeld, "Cast Resins."

November 15.—Annual Conjoint Meeting of Manchester Chemical Societies arranged by the Manchester Literary and Philosophical Society. Reynolds Hall, College of Technology. 7 p.m. Dr. Hugh B. Cott, "Camouflage in Nature and in War."

November 18.—Society of Dyers and Colourists. Literary and Philosophical Society, 36 George Street. 7 p.m. W. Cohen, "Some Principles of Drying," and W. H. Spooner, "Textile Drying Machinery."

November 21.—Institution of the Rubber Industry. Engineers' Club, Albert Square. 7.30 p.m. A. E. T. Neale, "Some Aspects of the Dust Problem as Encountered in Rubber Manufacture."

November 22.—Manchester Chemical Club. Ivan Levenstein Memorial Lecture. Professor A. G. Green, "Manchester Chemistry and Chemists of the Nineties."

Newcastle.

November 17.—Institute of Chemistry. Norton Hall. Dr. C. J. T. Cronshaw, "The Dyestuffs Industry."

Norwich.

November 22.—Institute of Chemistry (East Anglian Section). Joint Meeting with the Norwich Medicochirurgical Society. Technical College. A. L. Bacharach, "Food and Medicine."

Nottingham.

November 18.—Chemical Engineering Group. Joint meeting with the Nottingham Section of the Society of Chemical Industry. Welbeck Hotel. 7.30 p.m. W. J. Rees, "Refractories in Industrial Service."

St. Helens.

November 16.—Society of Glass Technology. Ordinary general meeting. Pilkington Bros., Ltd., Plate Glass Works. 2 p.m.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HYDREXIT, LTD., Harefield, manufacturers of waterproofing compounds.—October 26, debenture securing £1,660 or such greater or lesser sum as may be due from the company to the holders Vulcansons, Ltd.; general charge. (M., 12/11/38.) *—. Dec. 30, 1937.

REDVALES CHEMICAL CO., LTD., Bury. (M., 12/11/38.) Oct. 28, £350 debenture, to G. Baron, Bacup; general charge.

Satisfaction

I.C.I. METALS, LTD. (formerly Kynoch, Ltd.), London, S.W. (M.S., 12/11/38.) Satisfaction Nov. 1, of debentures registered Nov. 10, 1904, July 3, 1906 and Feb. 19, 1907.

County Court Judgment

THORNFIELD, G. (trading as Modene Co.), 88 Cambridge Road, N.W.6, manufacturing chemist. (C.C., 12/11/38.) £10 3s. 4d. Oct. 5.

Declaration of Solvency Filed

DEASON CHEMICAL CO., LTD., Newcastle-on-Tyne. (D.S.F., 12/11/38.) Oct. 29.

Receiver Appointed

BRITISH OXIDES, LTD., London, S.W. (R., 12/11/38.) J. G. V. Leeder, 46 Waterloo Street, Swansea. Oct. 31 (in place of J. H. Bateman, deceased).

New Companies Registered

Solwaye Freres, Ltd. 9,699.—Private company. Capital £5,000 in 5,000 shares of £1 each. To carry on the business of manufacturing and distributing chemists and druggists, etc. Subscribers: William Smullen, 194 Rathgar Road, Rathgar, Dublin; Charles E. Cope.

Ocean Salts (Products), Ltd. 345,900.—Private company. Capital £20,000 in 10,000 6 per cent. non-cumulative participating preference shares of £1 each, and 20,000 ordinary shares of 10s. each. To carry on business as producers and manufacturers of and dealers in minerals, ores, metals, chemicals and fabrics, proprietary articles, chemists, druggists, drysalters, oil and colour men, etc. Subscribers: Ernest H. Ford, 147 Grosvenor Road, S.W.1, John P. Ford. Registered office: 147 Grosvenor Road, S.W.1.